IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

July 23, 2016 and July 24, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL DRAFT

December 11, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On July 23, 2016 and July 24, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007), Calexico (AQS Site Code 060251003), El Centro (AQS Site Code 060251003), and Westmorland (AQS Site Code 060254003), California measured exceedances of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitors Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 195 µg/m^3, 203 µg/m^3, 155 µg/m^3, 194 µg/m^3, 162 µg/m^3, and 164 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. Of the five SLAMS located in Imperial County only the Niland monitor did not measure an exceedance of the NAAQS.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON JULY 23, 2016 AND JULY 24, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
7/23/2016	**Calexico**	**06-025-0005**	**3**	**24**	**195**	**150**
7/23/2016	**El Centro**	**06-025-1003**	**4**	**24**	**203**	**150**
7/24/2016	**Brawley**	**06-025-0007**	**3**	**24**	**155**	**150**
7/24/2016	**Calexico**	**06-025-0005**	**3**	**24**	**194**	**150**
7/24/2016	**El Centro**	**06-025-1003**	**4**	**24**	**162**	**150**
7/24/2016	**Westmorland**	**06-025-4003**	**3**	**24**	**164**	**150**
7/23/2016	Brawley	06-025-0007	1	24	129	150
7/23/2016	Niland	06-025-4004	1	24	111	150
7/23/2016	Brawley	06-025-0007	3	24	144	150
7/23/2016	Niland	06-025-4004	3	24	147	150
7/23/2016	Westmorland	06-025-4003	3	24	138	150
7/24/2016	Niland	06-025-4004	3	24	131	150

All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]
July 24, 2016 not a scheduled sampling day

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On July 23, 2016 and July 24, 2016, the Brawley, Calexico, El Centro, and Westmorland monitors were impacted by elevated particulate matter, caused by the transport

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term “standard time” or “daylight time”. For year-round use the designation can be left off inferring “local time” daylight or standard whichever is present. For 2015 Pacific Daylight Time (PDT) is March 13 through November 6. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

of fugitive windblown dust from high winds associated with a monsoonal “Gulf Surge” that moved into the region on July 23, 2016 through July 24, 2016.

This report demonstrates that a naturally occurring event caused an exceedance observed on July 23, 2016 and July 24, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the transport of windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedances of 195 µg/m^3, 203 µg/m^3, 155 µg/m^3, 194 µg/m^3, 162 µg/m^3, and 164 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER).[2]

I.1 Demonstration Contents

Section II - Describes the July 23, 2016 and July 24, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley, Calexico, El Centro, and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley, Calexico, El Centro, and Westmorland stations this section discusses and establishes how the July 23, 2016 and July 24, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the July 23, 2016 and July 24, 2016 event and its resulting emissions defining the event as a “natural event”.[3]

Section IV - Provides evidence that the event of July 23, 2016 and July 24, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published the National Weather Service (NWS) forecast for July 22, 2016 through July 25, 2016. The published notification, via the ICAPCD's webpage, forecast included the intrusion of monsoonal moisture into southeast California for the following week. The big story was the heat. There was a slight hint that temperatures may cool on Sunday, July 24, 2016 as thunderstorm chances could potentially return. Due to the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County July 23, 2016 and July 24, 2016. **Appendix A** contains copies of notices pertinent to the July 23, 2016 and July 24, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley, Calexico, El Centro and Westmorland monitors on April 17, 2017. The INPEE, for the July 23, 2016 and July 24, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days for 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for July 23, 2016 and July 24, 2016. A brief description of the meteorological conditions was provided to CARB, which provided preliminary information that indicated a potential natural event had occurred on July 23, 2016 and July 24, 2016.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on June 28, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the July 23, 2016 and July 24, 2016 measured concentrations of 155 µg/m^3 (Brawley), 195 µg/m^3 (Calexico), 203 µg/m^3 (El Centro), 164 µg/m^3 (Westmorland), 194 µg/m^3 (Calexico), and 162 µg/m^3 (El Centro) (**Table 1-1**). The final closing date for comments was July 30, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the July 23 and July 24, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on July 23, 2016 and July 24, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

a The event created the meteorological conditions that entrained emissions and caused the exceedance.
b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
d The event "is not reasonably controllable and not reasonably preventable."

e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”

f The event is a “natural event” where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley, Calexico, El Centro, and Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II July 23, 2016 and July 24, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the July 23, 2016 and July 24, 2016 event unfolded in Imperial County. The subsection elements include

» A description and map of the geographic setting of the air quality and meteorological monitors
» A description of Imperial County's climate
» An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**.The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

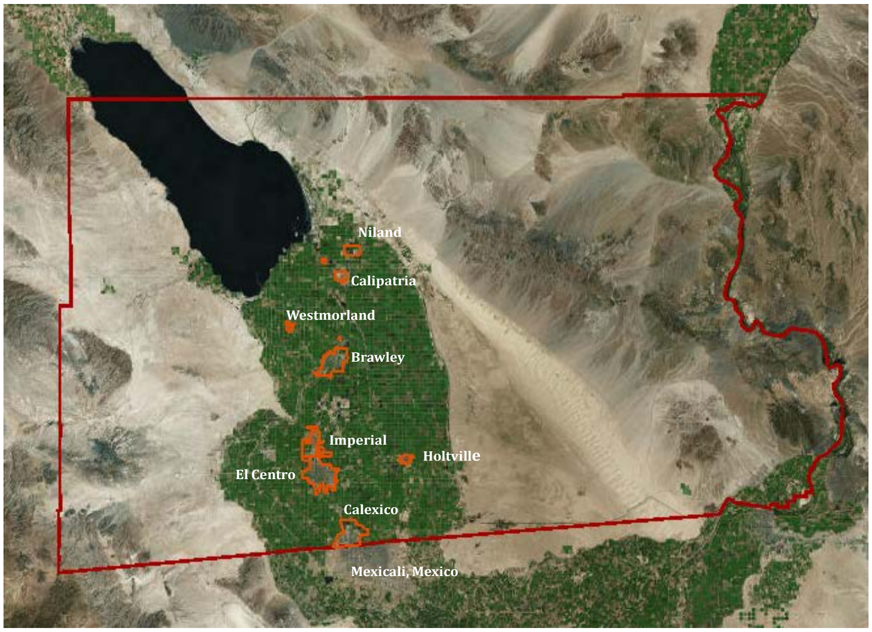


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

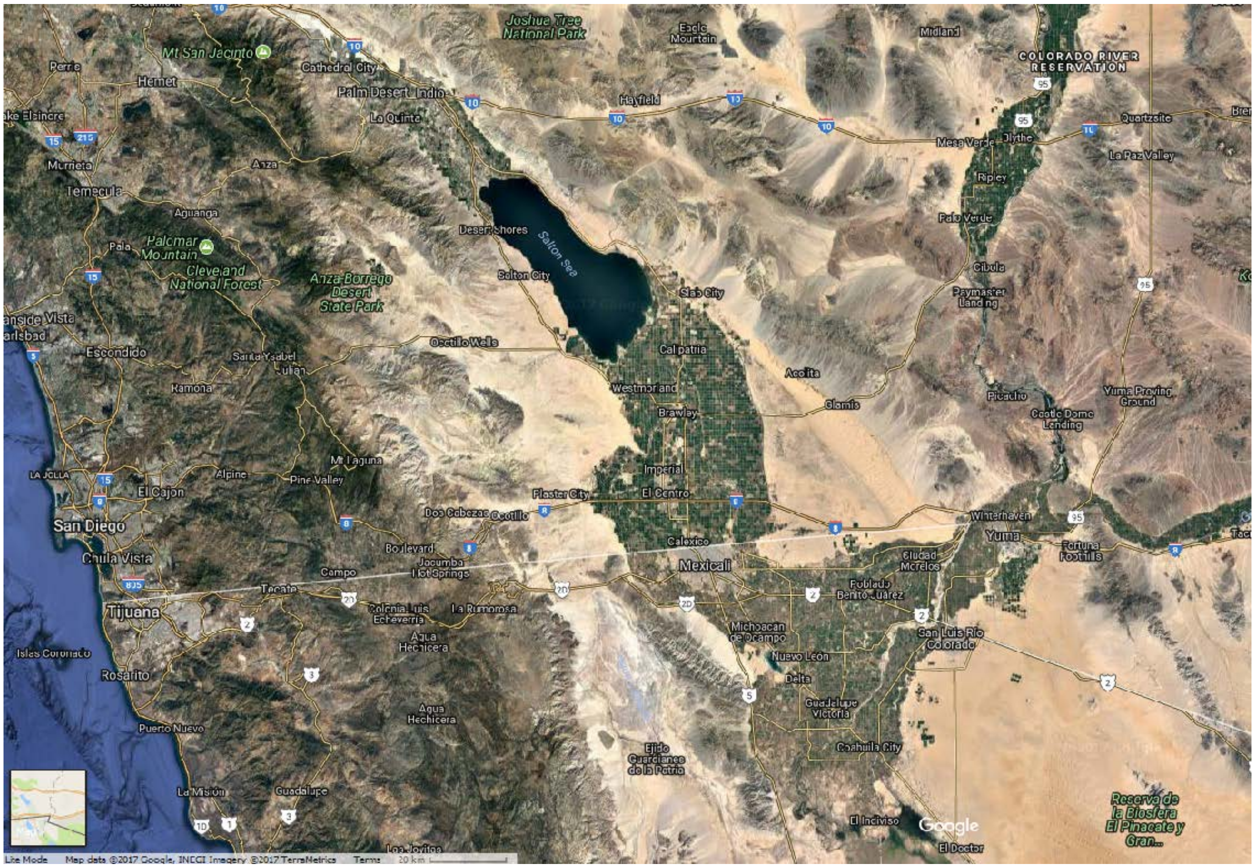


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedances on July 23, 2016 and July 24, 2016, occurred at the Brawley, Calexico, El Centro, and Westmorland monitors. The Brawley, Niland, and Westmorland monitors are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on July 23, 2016 and July 24, 2016, other meteorological sites were used in this demonstration such as airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the event, such as within northern Mexico. (**Figure 2-8 and Appendix B)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

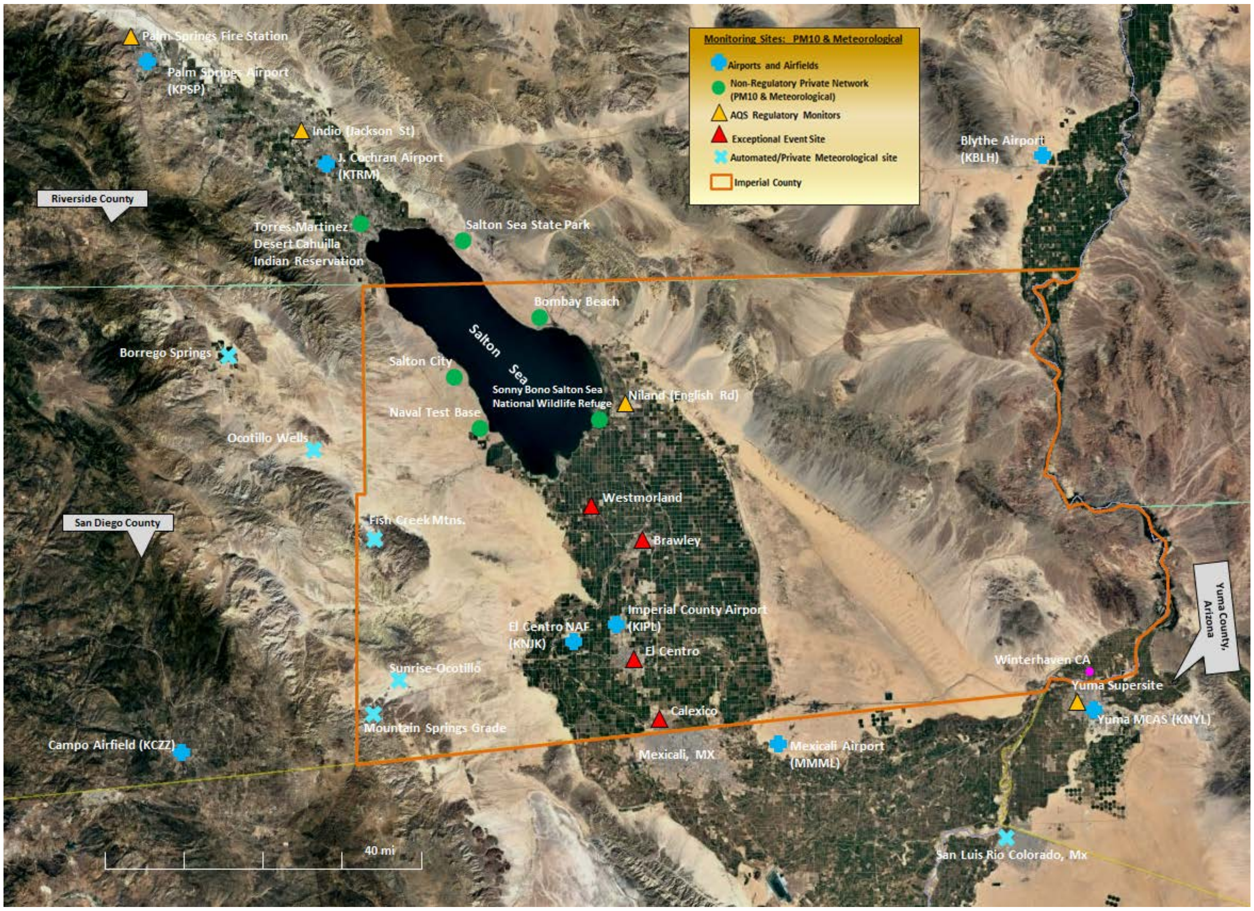


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station These privately owned and non-regulatory stations are located closest to the Imperial County air monitoring network (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard.

The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

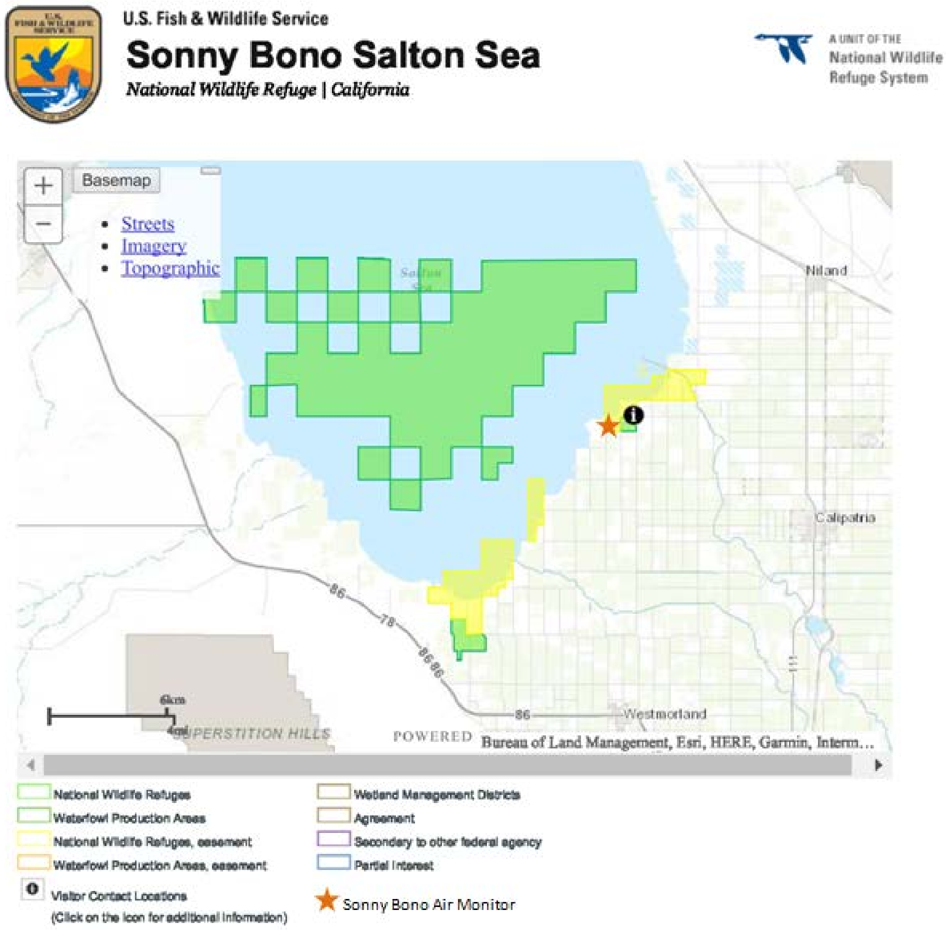


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
JULY 23, 2016 AND JULY 24, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	Day	24-hr PM_{10} ($\mu g/m^3$) Avg	1-hr PM_{10} ($\mu g/m^3$) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY												
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	81102	13701	-15	23	129	-	-	-	-
		BAM 1020						144	414	16:00		
		Hi-Vol Gravimetric					24	-	-	-	-	-
		BAM 1020						155	608	09:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	81102	13698	3	23	195	673	07:00	14.2	04:00
							24	194	985	08:00	13.2	08:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	81102	13694	9	23	203	760	08:00	11.6	05:00
							24	163	995	08:00	11.3	07:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	81102	13997	-54	23	111	-	-	16.7	05:00
		BAM 1020						148	354	09:00		
		Hi-Vol Gravimetric					24	-	-	-	17.9	08:00
		BAM 1020						131.3	310	08:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	81102	13697	-43	23	138	408	16:00	13.3	05:00
							24	164	909	09:00	12.9	17:00
RIVERSIDE COUNTY												
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	81102	33137	174	23	61	164	07:00	5	07:00
							24	42.2	111	20:00	9	18:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	81102	33157	1	23	119	263	20:00	11	06:00
							24	82	192	19:00	10.8	08:00
ARIZONA – YUMA												
Yuma Supersite	ADEQ	TEOM	04-027-8011	81102	N/A	60	23	299	1206	3:00	-	-
							24	224	1121	06:00	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)
July 24, 2016 was not a scheduled sampling day for FRM samplers.

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

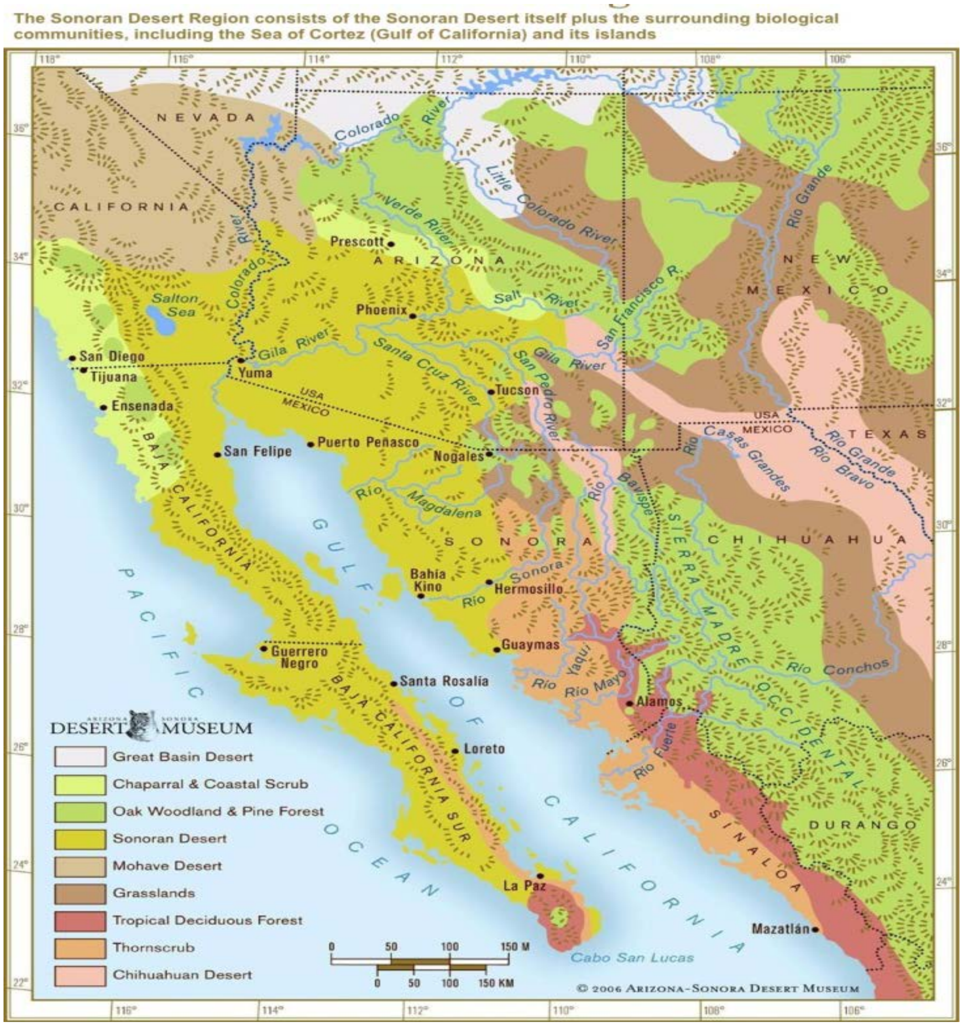


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16)**. During the 12-month period prior to the July 23, 2016 and July 24, 2016 event, Imperial County measured a total annual precipitation of 0.83 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

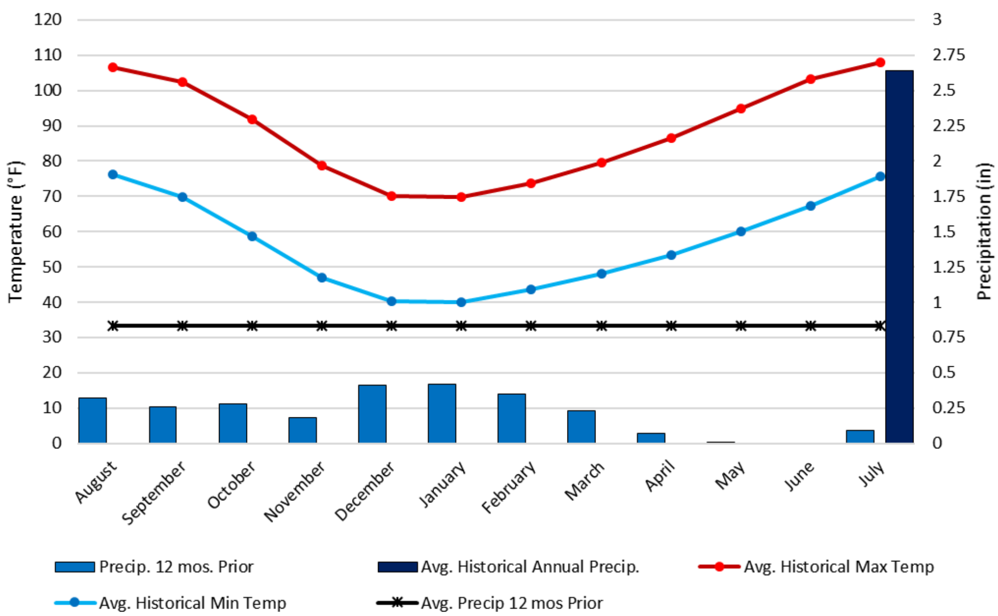


Fig 2-16: In the months prior to July 23, 2016 and July 24, 2016, the region suffered abnormally low total precipitation of 0.83 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the fall, winter, and spring are often due to strong winds associated with low-pressure systems and cold fronts, windblown dust events during the summer monsoon season are often due to wind flow aloft from the East or South-East. This phenomenon is known as the North American Monsoon (NAM)[5]. The NAM occurs when there is a shift in wind patterns during the summer, which occurs as Mexico and the southwest United States warm under intense solar heating reversing airflow from dry land areas to moist ocean areas. Consequently, the prevailing winds start to flow from moist ocean areas into dry land areas (**Figure 2-17**).

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

[5] National Weather Service document "North American Monsoon" public domain material from the NWS Forecast Office Tucson, Arizona

FIGURE 2-17
WEATHER PATTERN OF THE NORTH AMERICAN MONSOON

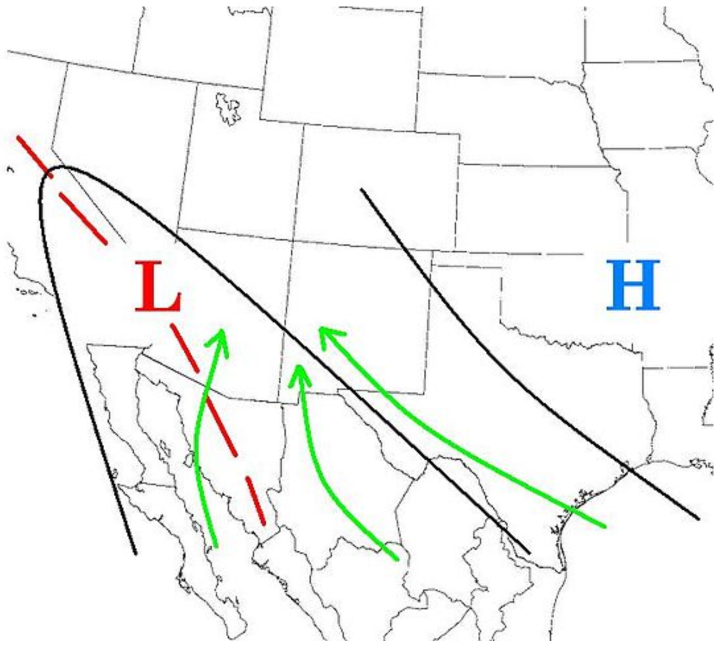


Fig 2-17: Weather pattern of the North American Monsoon. The North American monsoon, variously known as the Southwest monsoon, the Mexican monsoon, or the Arizona monsoon is a pronounced increase in rainfall from an extremely dry June to a rainy July over large areas of the southwestern United States and northwestern Mexico. Image courtesy of Wikipedia "North American Monsoon."

The NAM circulation typically develops in late May or early June over southwest Mexico. By mid to late summer, thunderstorms increase over the "core" region of the southwest United States and northwest Mexico[6]. The transport of moisture into Mexico, Arizona and the southwestern United States can come quickly and sometimes dramatically , known as "bursts" and "breaks" which can unleash violent flash floods, thousands of lightning strikes, crop-damaging hail, and walls of damaging winds and blowing dust.[7]

The monsoon typically arrives in mid to late June over northwest Mexico and early July over the southwest United States. While the southern areas of Mexico experience a low level monsoon circulation, transported primarily from the Gulf of California and the eastern Pacific, an upper level monsoon (or subtropical) ridge develops over the southern High Plains and northern Mexico. Thus, by late June or early July the ridge shifts into the southern Plains or southern Rockies creating less resistance for the mid and upper level moisture streams to enter the United States. If the ridge is too close to a particular area, the sinking air, at its center suppresses

[6] According to the NWS Tucson Arizona regional office report affected areas include the United States, Arizona, New Mexico, Sonora, Chihuahua, Sinaloa and Durango.
[7] 2004: The North American Monsoon. Reports to the Nation on our Changing Planet. NOAA/National Weather Service. Available on line at: http://www.cpc.noaa.gov/products/outreach/Report-to-the-Nation-Monsoon_aug04.pdf

thunderstorms and can result in a significant monsoon "break". However, if the ridge sets up in a few key locations, widespread and potentially severe thunderstorms can develop.

In Imperial County, isolated thunderstorms begin to develop, mainly during the hottest part of the day. The convective uplift of moist air over the hot desert landscape can produce thunderstorms, which in turn can generate gusty and highly variable winds. On occasion, a few of these thunderstorms are pushed by the winds into the lower deserts during the evening hours.

Thus, when high humid air is pushed up the Gulf of California, also known as a gulf surge the most common synoptic pattern is an easterly wave over central Mexico and an intensifying thermal low over the desert southwest. Although current studies include the relationship of gulf surges to tropical easterly and midlatitude westerly waves, additional study remains in order to understand why some gulf surges contain sufficient precipitation while others do not. Suffice to say that during the NAM season there are northward surges of relatively cool, moist maritime air from the eastern tropical Pacific into the southwestern United States via the Gulf of California (e.g. Hales 1972; Brenner 1974; Stensrud et al. 1997; Fuller and Stensrud 2000). These events are related to the amount of convective activity in northwestern Mexico and portions of the southwestern United States.[8]

FIGURE 2-18
CONCEPTUAL DIAGRAM OF GULF SURGE TRIGGER

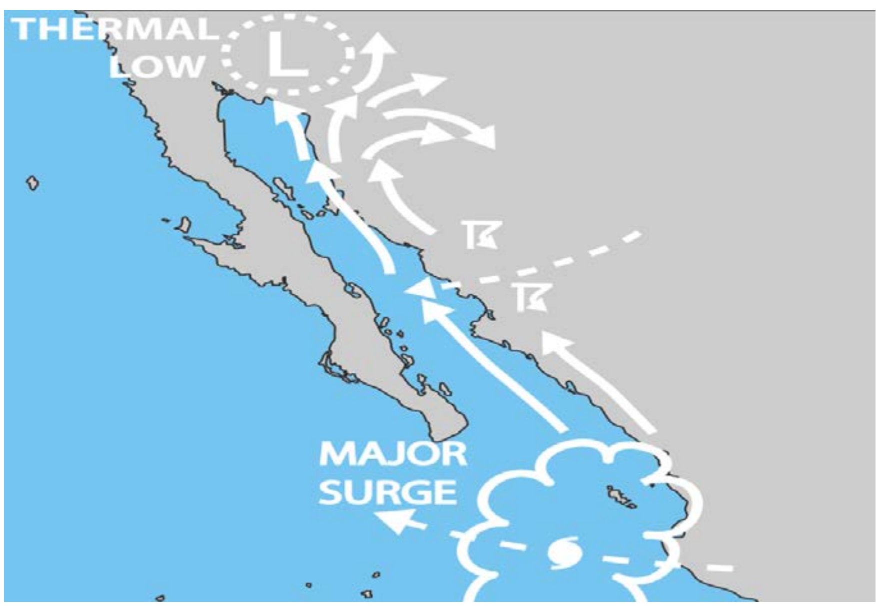


Fig 2-18: A conceptual diagram of how a tropical system can trigger a gulf surge. Source: Gulf of California moisture surge Wikipedia The Free Encyclopedia https://en.wikipedia.org/wiki/Gulf_of_California_moisture_surge

[8] Relationships Between Gulf of California Moisture Surges and Precipitation in the Southwestern United States, R.W. Higgins, W. Shi and C. Hain, Climate Prediction Center, NOAA/NWS/NCEP February 2004 (Journal of Climate – in Press) https://www.eol.ucar.edu/projects/name/documentation/hsh04.pdf

II.3 Event Day Summary

The exceptional event for July 23, 2016 through July 24, 2016, caused by a gulf surge, was an unexpected occurrence when tropical storm outflow boundaries moved out of Mexico, up Baja California and into the southwest. The National Weather Service (NWS) offices in San Diego and Phoenix both concentrated discussions on the ongoing Heat Advisories and Excessive Heat Warnings days prior to July 23, 2016 with no possibility of thunderstorms, thus neither agency expected the gulf surge. Meanwhile, the Servicio Meteorológico Nacional (SMN) in Mexico tracked the formation of tropical storms "Georgette" and "Frank." Both storms formed within days of each other and turned into hurricanes intensifying in strength Saturday, July 23, 2016 through Sunday, July 24, 2016. Of the two hurricanes, "Frank" was closest to Baja California and, in all likelihood, would have been the impetus for the gulf surge. Both hurricanes diminished in category by Monday, July 25, 2016.

On July 23, 2016 and July 24, 2016, gusty southerly winds, associated with a gulf surge transported windblown dust emissions from areas as far south as northeastern Mexico affecting areas in southern Arizona, Yuma, Blythe, Thermal and Imperial County and causing an exceedance at the Brawley, Calexico, El Centro and Westmorland monitors.

Figures 2-19 through 2-25 provide information regarding the meteorological conditions and resulting wind speeds that allowed an unexpected gulf surge to affected southern Arizona, Yuma, Blythe, Thermal and Imperial County. Outflow boundaries associated with the unstable air caused gusty winds across southeastern California and southwestern Arizona.

FIGURE 2-19
IDENTIFIED STORMS JULY 22, 2016

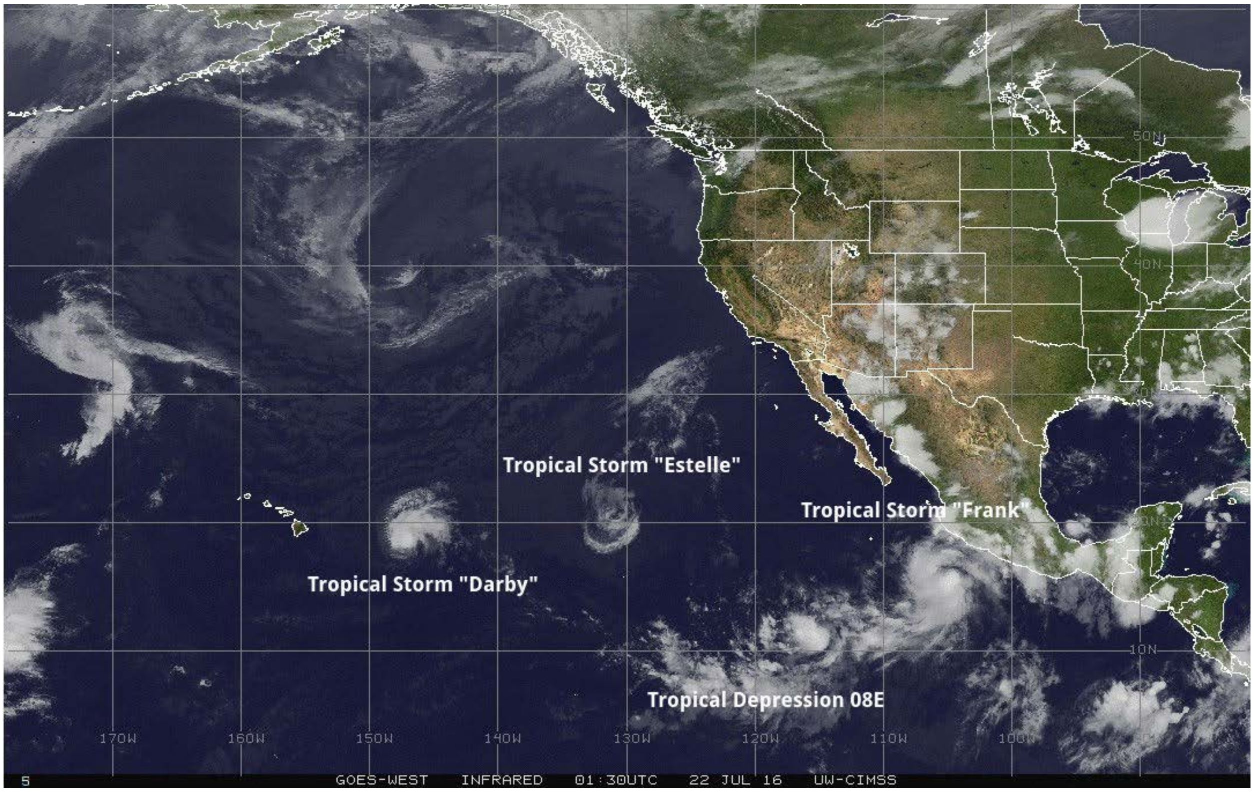


Fig 2-19: GOES-West image taken at 0130 UTC on July 22, 2016 identifies three (3) tropical storms in the eastern and central Pacific as Darby, Estelle and Frank. Tropical depression 08E categorized a tropical storm was named “Georgette” late July 22, 2016 and quickly intensifies as it moves over the warm waters of the eastern Pacific away from the Mexican coast. By July 23, 2016, “Georgette”, a hurricane quickly becomes a category 4 hurricane July 24, 2016. As fast as “Georgette” becomes a hurricane, she quickly weakens on July 25, 2016

FIGURE 2-20
TROPICAL STORM "FRANK" JULY 22, 2016

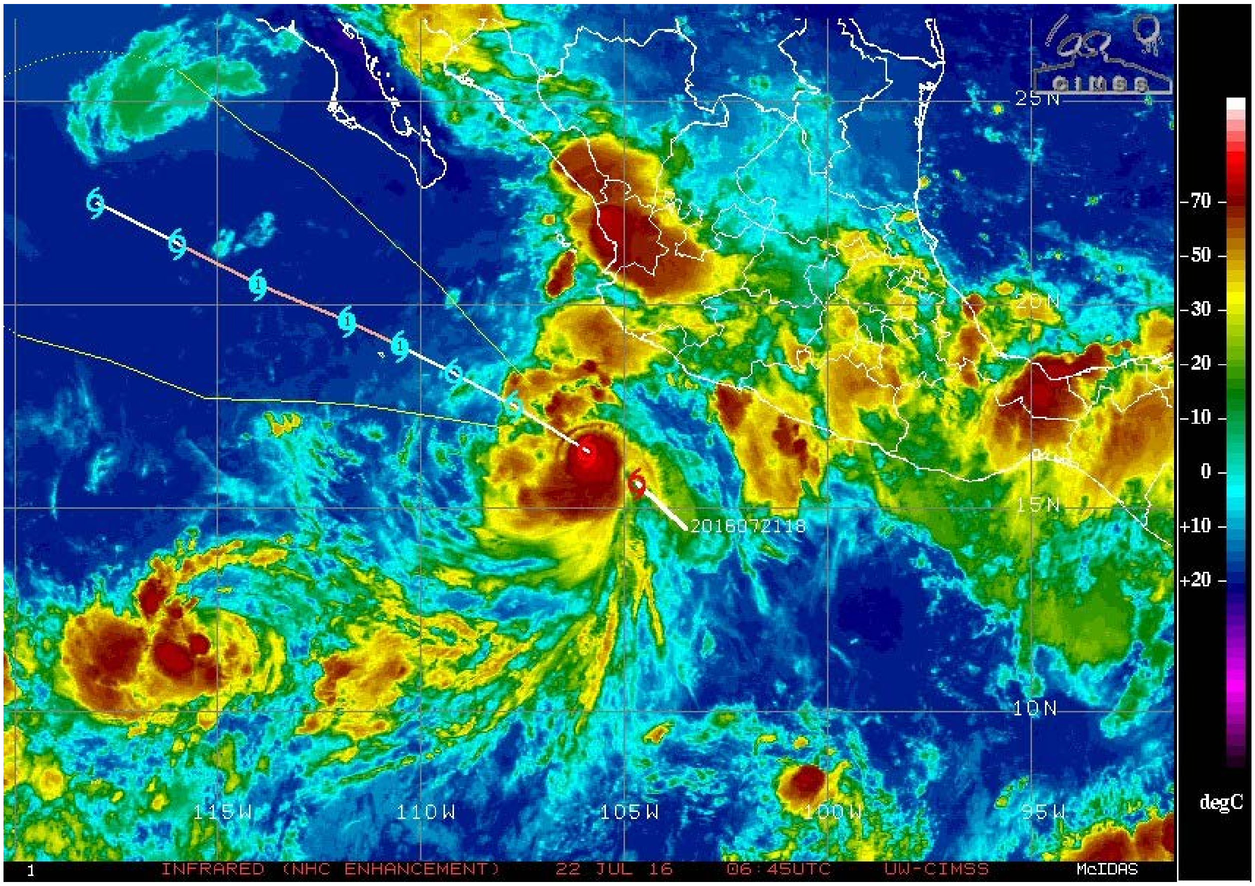


Fig 2-20: An infrared image taken at 0646 UTC on July 22, 2016 illustrates the projected path of tropical storm "Frank." As "Frank" moved in a general west northwest direction by July 23, 2016, coupled with the tropical wave number 16 and an interior low-pressure, meteorological conditions became conducive to elevated levels of humidity resulting in gale type winds in Puebla, Michoacán, Guerrero, Baja California, Sinaloa, Durango, Guanajuato, Querétaro, Hidalgo, Tlaxcala, Morelos, the state of Mexico and Mexico City.[9]
Source: The Weather Channel Hurricane Georgette (Recap): https://weather.com/storms/hurricane/news/tropical-depression-8-e-tropical-storm-georgette-hurricane

[9] Starmedia; Weather Forecast in Mexico, Today July 23, 2016 https://www.starmedia.com/noticias/pronostico-clima-en-mexico-hoy-23-julio-2016/

FIGURE 2-21
TROPICAL STORMS JULY 23, 2016

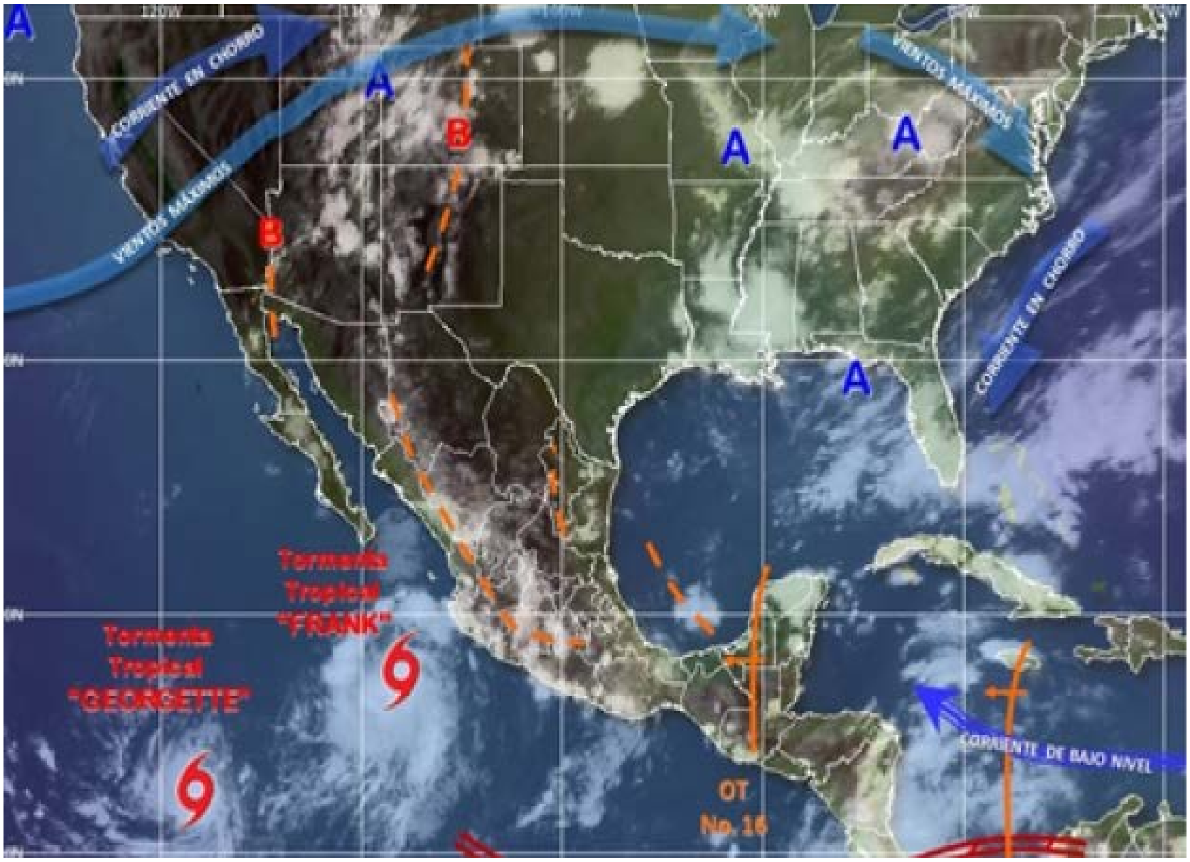


Fig 2-21: A weather map depicting the presence of tropical storms "Georgette" and "Frank" and the associated low-pressure and tropical wave 16 on July 23, 2016. The article written by Ejo Central explained that the combination of the tropical storm "Frank", tropical wave number 16, the low-pressure and moisture from both coasts caused gales in Puebla, Michoacán, Guerrero, Baja California, Sinaloa, Durango, Guanajuato, Querétaro, Hidalgo, Tlaxcala, Morelos, the state of Mexico and Mexico City.[10]
Source: Ejo Central article posted July 23, 2016:
http://cdc-s3-ejece-main.s3.amazonaws.com/uploads/2016/07/cNTX160723003.jpg

[10] Ejo Central, presence of "Frank" will cause storms, July 23, 2016. http://www.ejecentral.com.mx/presencia-de-frank-propiciara-tormentas/

FIGURE 2-22
MODIS JULY 23, 2016

Fig 2-22: The MODIS instrument onboard the Aqua satellite captured the clouds associated with the tropical systems over the eastern Pacific on July 23, 2016 at 1330 PST. Source: MODIS Today

FIGURE 2-23
TROPICAL STORMS JULY 24, 2016

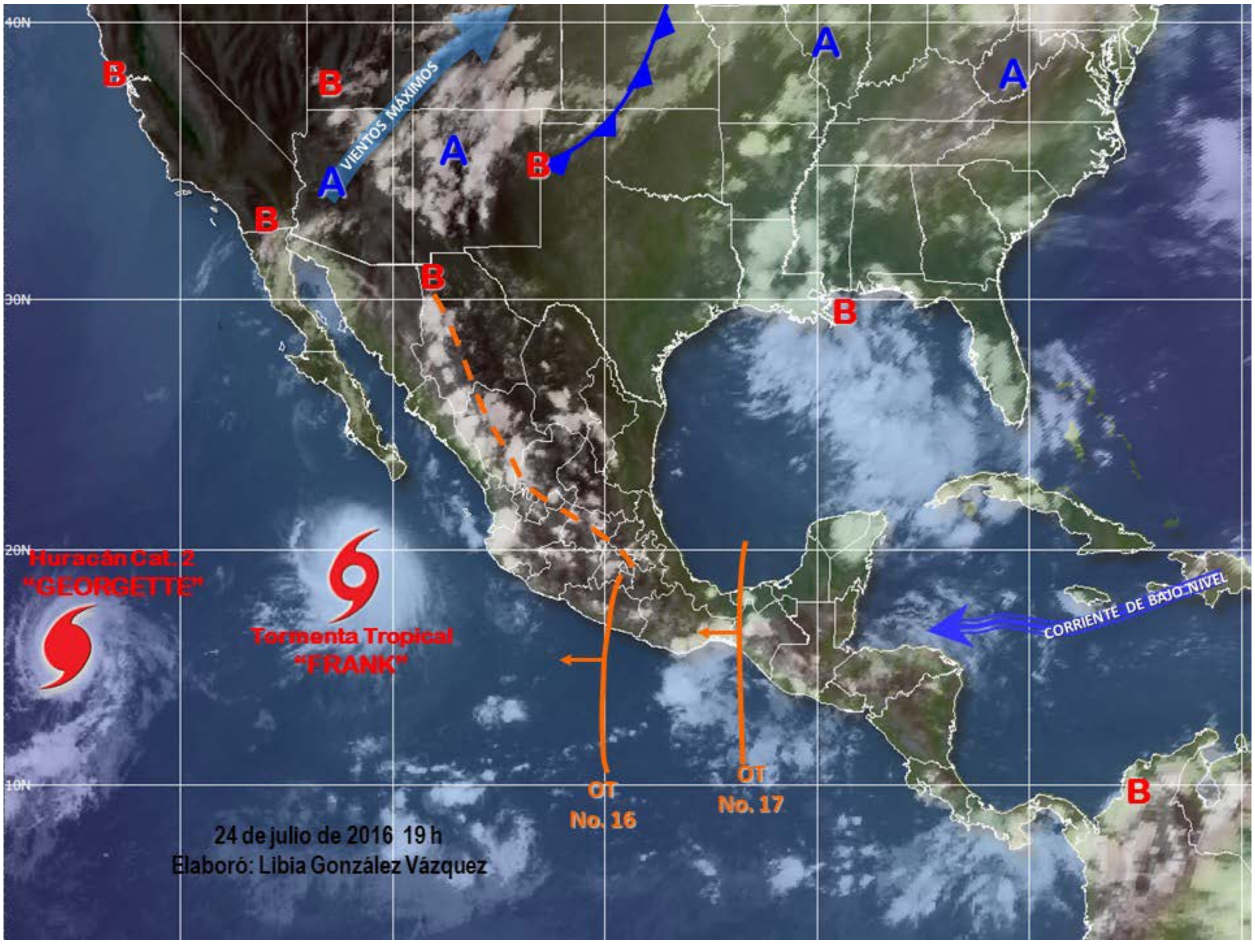


Fig 2-23: A weather map depicting the presence of tropical storms "Georgette" and "Frank" and the associated low-pressure and tropical waves 16 and 17 on July 24, 2016. The article written by Plano Informativo explained that the combination of the a low pressure located within the interior of Mexico, tropical waves numbers 16 and 17 and tropical storm "Frank" would cause showers with strong storms in Baja California Sur, Sonora, Chihuahua, Durango, the State of Mexico, Mexico City, Morelos, Puebla, Hidalgo, Tabasco, Campeche, Yucatan and Quintana Roo. Source: Plano Informativo article posted July 24, 2016; http://planoinformativo.com/stock12/image/2016/Julio/24/mexico2.jpg

FIGURE 2-24
MODIS JULY 24, 2016

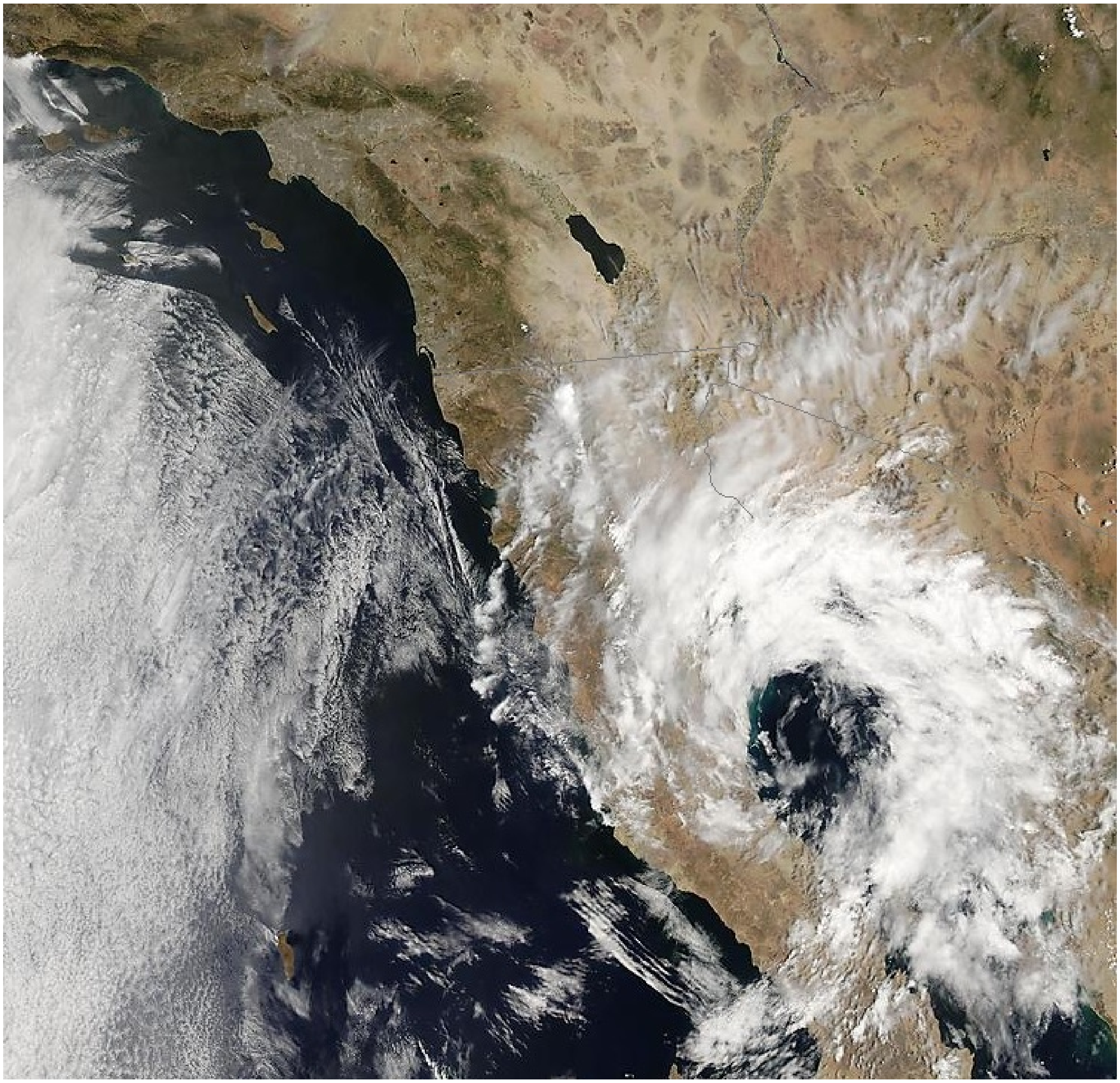


Fig. 2-24: The MODIS instrument onboard the Aqua satellite captured the clouds associated with the tropical systems over the eastern Pacific on July 24, 2016 at 1330 PST. Source: MODIS Today

FIGURE 2-25
SOUTHERLY WINDS GENERATED BY THE WEATHER SYSTEM

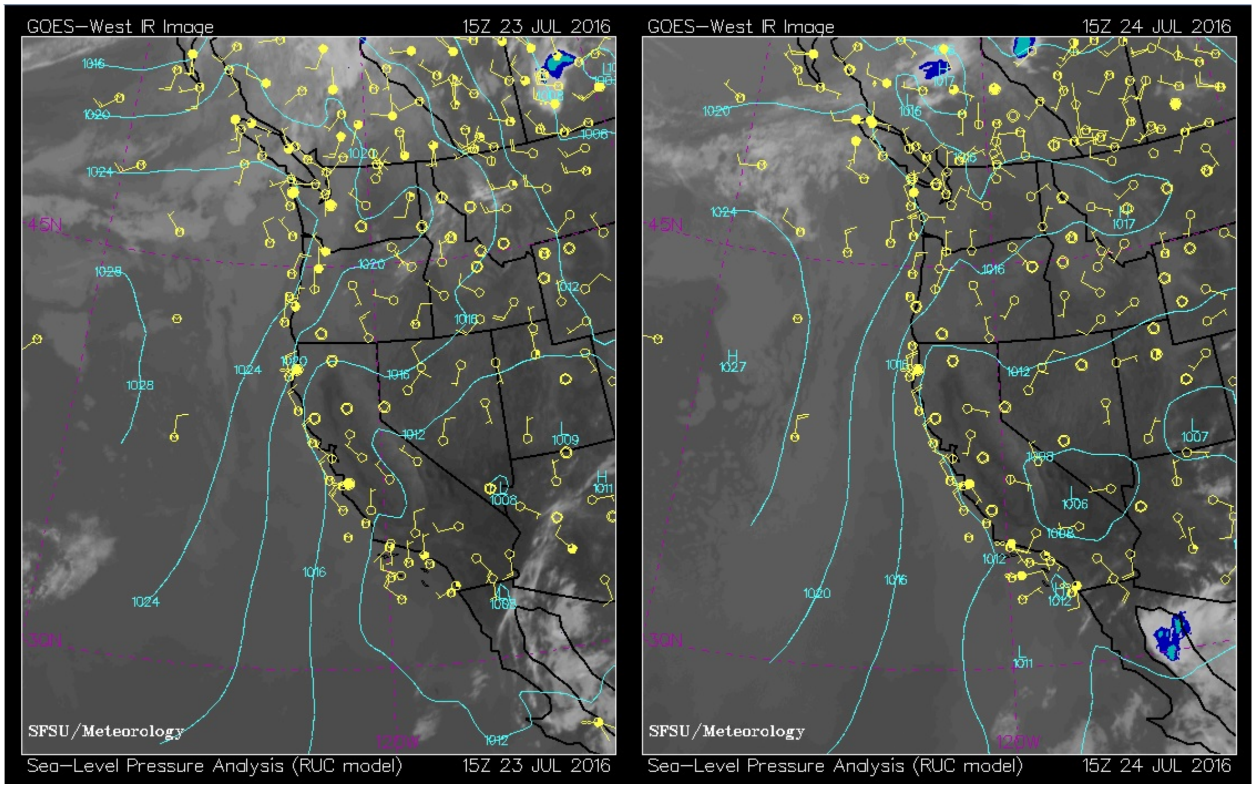


Fig 2-25: Southerly winds resulted as meteorological conditions in Mexico allowed for a gulf surge to affect the southwestern states. Wind barbs at KNJK depict southerly winds of at least 23 mph at 0700 LST on July 23, 2016 (left) and July 24, 2016 (right). In actuality, winds were higher. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server

As mentioned above, the NWS in San Diego and Phoenix did not expect an impact from the tropical storms "Georgette" and "Frank" into the southwestern states before Monday, July 25, 2016. The concern by both offices was the strong high pressure over Southern California and the resulting warning level heat. Area forecast discussions by both offices indicated an expected change in the weather pattern by Monday, July 25, 2016 when convection and an unstable air mass from the south could potentially promote storm activity and in San Diego potentially cooler weather and thunderstorms in the mountains by mid-week.

However, by 0736 am PST (0836 am MST) Saturday July 23, 2016 the Phoenix NWS office reported a "surprise." The issued area forecast discussion identified "an old and distantly traveled convective outflow boundary" that moved out of Mexico and into southern Arizona and a weak boundary that moved through Phoenix with southerly gusts measured at Yuma and Blythe. The San Diego NWS office identified a gulf surge in the lower deserts with peak gusts near 30 mph at Thermal in its 0812 am PST (0912 am PDT) issued area forecast for Saturday, July

23, 2016. The San Diego NWS office also identified winds as generally light except in the southern deserts where the gulf surge developed.

By 0111 pm PST (0211 pm MST), Saturday, July 23, 2016 the Phoenix NWS office updated its aviation forecast for Southeast California and Southwest Arizona, describing a "[s]trong outflow and outflow driven Gulf surge" as persisting strong and at times with south to southeasterly gusty winds. The update included a warning for hazy conditions created by dust from the outflow and continued scattered clouds throughout the evening. This continued through Sunday, July 24, 2016. In fact, by 0315 am PST (0415 am PDT) on July 24, 2016 the San Diego NWS office describes a large convective complex over northwest Mexico with the mid to high-level moisture moving westward across northern Baja potentially affecting "far southern California." The Phoenix office, at 0730 am PST (0830 am MST) July 24, 2018 similarly confirms a large convective complex south of the border as generating northward moving outflows that affected Yuma, Blythe and the City of Imperial (KIPL). The area forecast discussion identified southerly gusts of 43 mph in Yuma, south and southeasterly wind gusts up to 31 mph at Imperial and 30 mph in Blythe.

Locally, winds elevated and were gusty on July 23, 2016 through July 24, 2016 throughout the region. At the Yuma MCAS (KNYL), the Mexicali airport (MMML), the Imperial County airport (KIPL), the El Centro NAF (KNJK) and the Calexico station all begin to measure elevated wind speeds at approximately 0400 am PST on July 23, 2016 and continued at moderate levels through July 24, 2016. Measured winds at the Yuma MCAS were the highest for both July 23, 2016 and July 24, 2016 with a combined six (6) hours of winds at or above 25 mph and eleven (11) hours of gusts up to 44 mph. KIPL and KNJK both measured winds up to 24 mph with KIPL measuring a combined five (5) hours of gusts up to 31 mph while KNJK measured a single hour of gust at 20 mph. In addition, both KIPL and KNJK reported haze coincident with measured peak concentrations at all the air monitoring stations.

Although winds were elevated, the Calexico station did not measure winds at or above 25 mph, the Mexicali airport measured one hour at or above 25 mph. The El Centro, Westmorland and Niland stations all began measuring elevated winds, albeit below the 25 mph threshold approximately one hour later. Likewise, the Blythe airport (KBLH) began measuring elevated winds at approximately 0500 PST with a combined two (2) hours of winds measured above the 25 mph threshold and ten (10) hours of gusts up to 38mph. Finally, on July 23, 2016 and July 24, 2016 other airports located in Mexico, such as the San Luis Colorado airport, measured elevated moderate winds as early as 0400 PST July 23, 2016 with significant wind gusts reaching 40 mph.

Figures 2-26 and 2-27 are depictions of the ramp-up analysis for July 23, 2016 and July 24, 2016, depicting the meteorological conditions caused by an unexpected gulf surge that entered Imperial County affecting air quality and causing an exceedance on July 23, 2016 and July 24, 2016 at differing air monitoring stations in Imperial County.

FIGURE 2-26
RAMP-UP ANALYSIS JULY 23, 2016

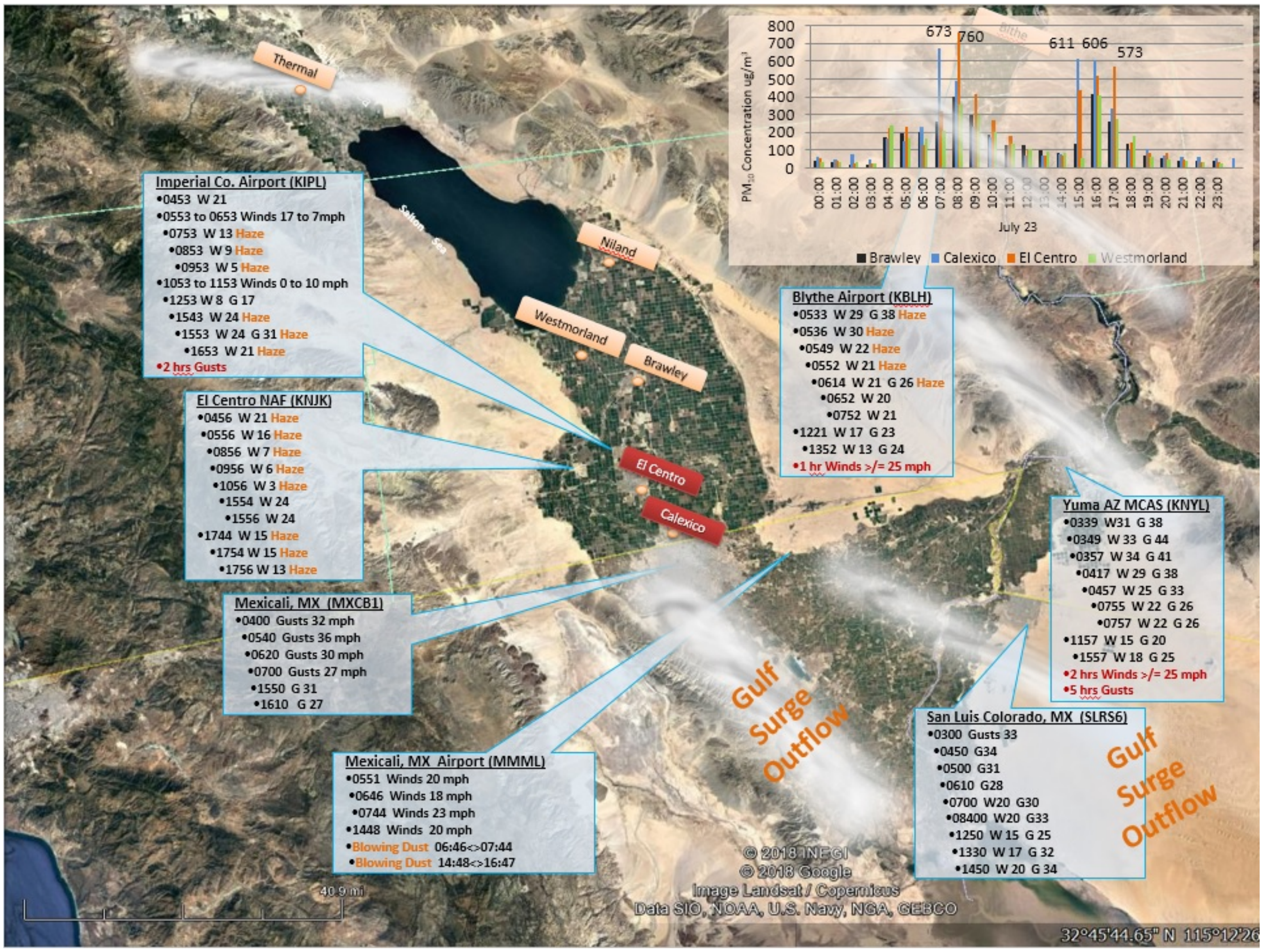


Fig 2-26: According to the NWS office, observations early July 23, 2016 indicated a gulf surge entered into the lower deserts with high clouds drifting northwest over the lower Colorado River Valley and a remnant mesoscale cyclonic vortices (MCV) drifting west over the northern Gulf of California. The NWS office identified measured peak winds at Thermal of 30 mph. Other areas mentioned by the NWS office were Blythe and Yuma. The Phoenix NWS office updated its aviation section at 0111 pm PST (0211 pm MST), July 23, 2016, indicating dust from the outflow causing hazy conditions. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

FIGURE 2-27
RAMP-UP ANALYSIS JULY 24, 2016

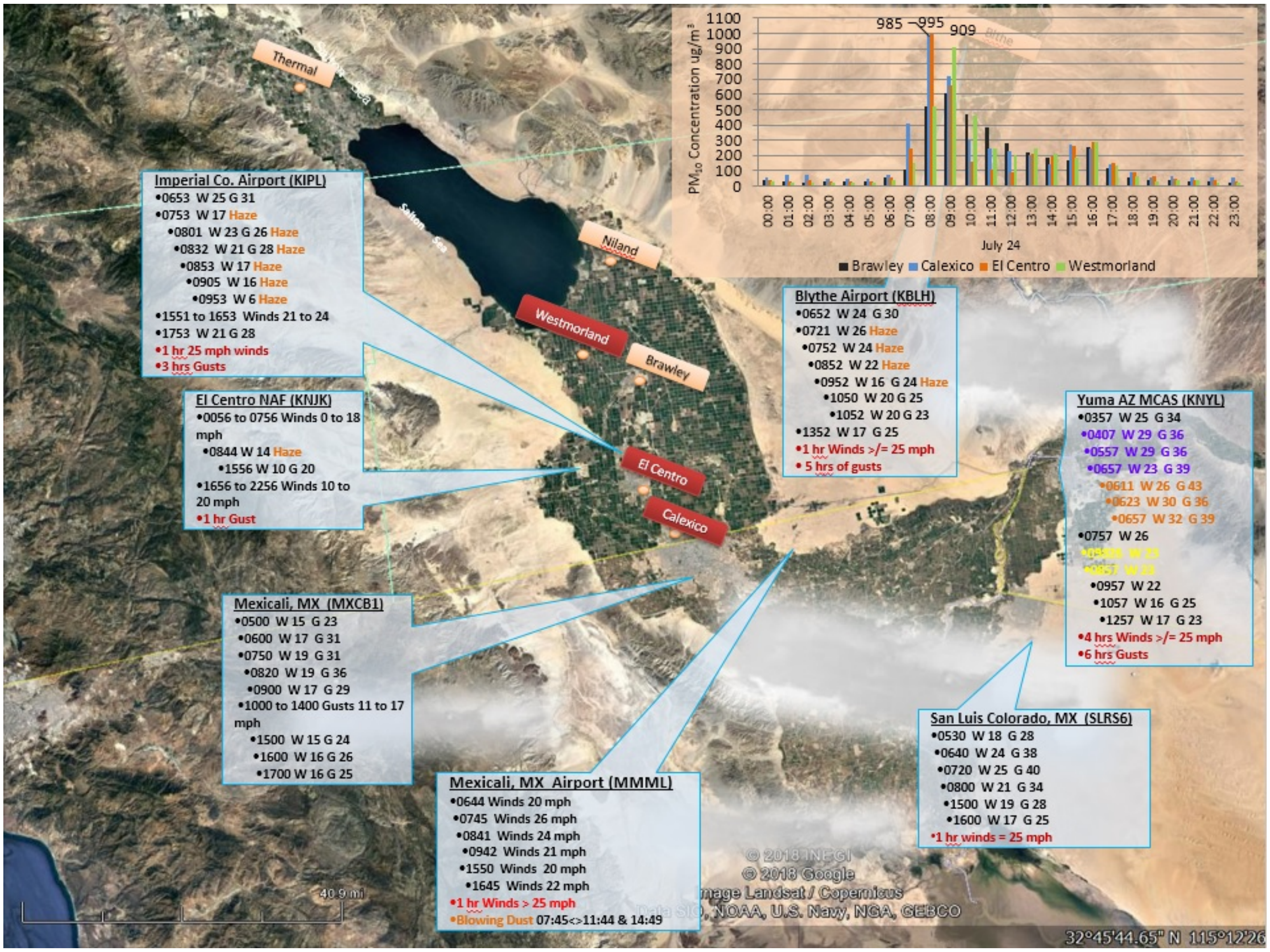


Fig 2-27: On July 24, 2016 the NWS office indicated that satellite imagery and lightning detection data identified the large convective complex over northwest Mexico with the bulk of the mid and high level moisture westward across northern Baja possibly just grazing far southern California. The Phoenix office, at 0730 am PST (0830 am MST) similarly confirmed the large convective complex south of the border as generating northward moving outflows that affected Yuma, Blythe and the City of Imperial (KIPL). The area forecast discussion identified southerly gusts of 43 mph in Yuma, south and southeasterly wind gusts up to 31 mph at Imperial and 30 mph in Blythe. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Table 2-4 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON JULY 23, 2016 AND JULY 24, 2016

Station Monitor							PM$_{10}$ correlated to time of Max Wind Speed				
Airport Meteorological Data	Day	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	Brly	CX	EC	Wstmd	Nlnd
IMPERIAL COUNTY											
Imperial Airport (KIPL)	23	24	130	15:53	31	15:53	134	611	435	57	66
	24	25	140	6:53	31	6:53	56	69	53	40	51
Naval Air Facility (KNJK)	23	24	140	15:56	-	-	134	611	435	57	66
	24	20	140	16:56	20	15:56	250	242	290	291	279
Calexico (Ethel St)	23	14.2	128	4:00	-	-	174	165	222	237	58
	24	13.2	144	8:00	-	-	521	985	995	525	310
El Centro (9th Street)	23	11.6	152	5:00	-	-	196	153	233	168	334
	24	11.3	149	7:00	-	-	105	409	247	146	153
Niland (English Rd)	23	16.7	130	5:00	-	-	196	153	233	334	334
	24	17.9	146	8:00	-	-	521	985	995	525	310
Westmorland	23	13.1	141	16:00	-	-	414	606	521	408	343
	24	12.9	147	17:00	-	-	112	145	151	137	200
RIVERSIDE COUNTY											
Blythe Airport (KBLH)	23	29	190	5:33	38	5:33	196	153	233	168	334
	24	26	190	7:21	30	6:52	105	409	247	146	153
Palm Springs Airport (KPSP)	23	16	110	6:53	25	6:53	202	228	127	164	250
	24	16	100	7:53	22	18:53	105	409	247	146	153
Jacqueline Cochran Regional Airport (KTRM) - Thermal	23	16	140	6:52	23	6:52	202	228	127	164	250
	24	15	160	7:52	24	7:52	105	409	247	146	153
ARIZONA - YUMA											
Yuma MCAS (KNYL)*MST	23	34	150	3:57	44	3:57	16	44	22	24	25
	24	32	160	6:57	43	6:11	56	69	53	40	51
MEXICALI - MEXICO											
Mexicali Int. Airport (MXL)	23	23	140	7:44	-	-	401	489	760	358	302
	24	26.5	120	7:45	-	-	521	985	31	525	310

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

When the outflows from the gulf surge affected Imperial County on July 23, 2016 and July 24, 2016, measured concentrations at all air monitors in Imperial County elevated. On July 23, 2016, all air monitors, except the Calexico and Niland monitors, measured elevated concentrations (>100 µg/m^3) between the hours 0400 PST and 1800 PST. 0500 PST was the earliest hourly measured concentration at the Niland monitor and 1900 pm PST was the last measured hourly concentration at the Calexico monitor above 100 µg/m^3. On July 24, 2016, all air monitors measured elevated hourly concentrations above 100 µg/m^3 between the hours of 0700 PST and 1700 PST. Peak concentrations, during both days, measured at all air monitors ranged between 0700 PST and 0900 PST, except for Brawley and Westmorland, which measured hourly peak concentration at 1600 PST on July 23, 2016.

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory models,[11] **Figures 2-28 through 2-31** depict the general path of airflow 12 hours prior to 0900am PST, 1900 pm PST on July 23, 2016 and 0900 am PST and 1700 pm PST on July 24, 2016. These hours are generally coincident with the approximate time air monitors measured peak concentrations and when air monitors stopped measuring concentrations above 100 µg/m^3.

On July 23, 2016, the description given by the San Diego NWS, 0812 am PST (0912 am PDT) indicated that a gulf surge moved into the lower deserts with high clouds drifting northwest over the lower Colorado River Valley and a remnant mesoscale cyclonic vortices (MCV) drifting west over the northern Gulf of California. The Phoenix NWS office described dust from the outflows associated with the Gulf surge in its aviation section of the area forecast for 0111 pm PST (0211 pm MST).

Figures 2-28 and 2-29 include a 12-hour back-trajectory ending at 0900 PST and 1900 PST on July 23, 2016. Airflow is distinctly from the south, southeast at all monitors. The surface level airflow is evident for most of the twelve hours prior to 0900 am PST coincident with the elevated wind speeds at the Yuma MCAS Airport, the Blythe Airport (KBLH), and the Imperial County Airport (KIPL). Wind speeds prior to the 1900 pm PST hour are moderate at all air monitors, with KIPL and the El Central NAF (KNJK) reporting hazy conditions from 1500 pm PST to 1800 pm PST. Transported dust from the natural desert areas located to the south, southeast of Imperial County and from northern Mexico would have blown into the desert and agricultural floor of Imperial County allowing for deposition of particulates onto the air monitors. All monitors measured elevated concentrations, with a 24-hour average above 130 µg/m^3 However, only the Calexico and El Centro monitors measured an exceedance of the NAAQS.

On July 24, 2016, satellite imagery and lightning detection data, identified by the San Diego NWS office, revealed a large convective complex over northwest Mexico. The Phoenix NWS office identified northward moving outflows which affected the lower Colorado River Valley at Yuma with southerly gusts of 43 mph and south and southeasterly wind gusts to 31 mph at KIPL.

Figures 2-30 and 2-30 include a 12-hour back-trajectory ending at 0900 PST and 1700 PST on July 24, 2016. Airflow is distinctly from the south, southeast at all monitors. The surface level airflow is evident for most of the twelve hours prior to 0900 am PST coincident with the elevated wind speeds at the Yuma MCAS Airport, the Blythe Airport (KBLH), and the Imperial County Airport (KIPL). KBLH, KIPL and KNJK reported haze during the early morning hours, 0700 am PST and 0800 am PST. Transported dust from the natural desert areas located to the south, southeast of Imperial County and from northern Mexico would have blown into the desert and agricultural

[11] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

floor of Imperial County allowing for deposition of particulates onto the air monitors. All monitors measured elevated concentrations, with a 24-hour average above 130 µg/m^3 with all monitors exceeding the standard except for the Niland monitor. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-28
HYSPLIT MODELS ENDING 0900 PST JULY 23, 2016

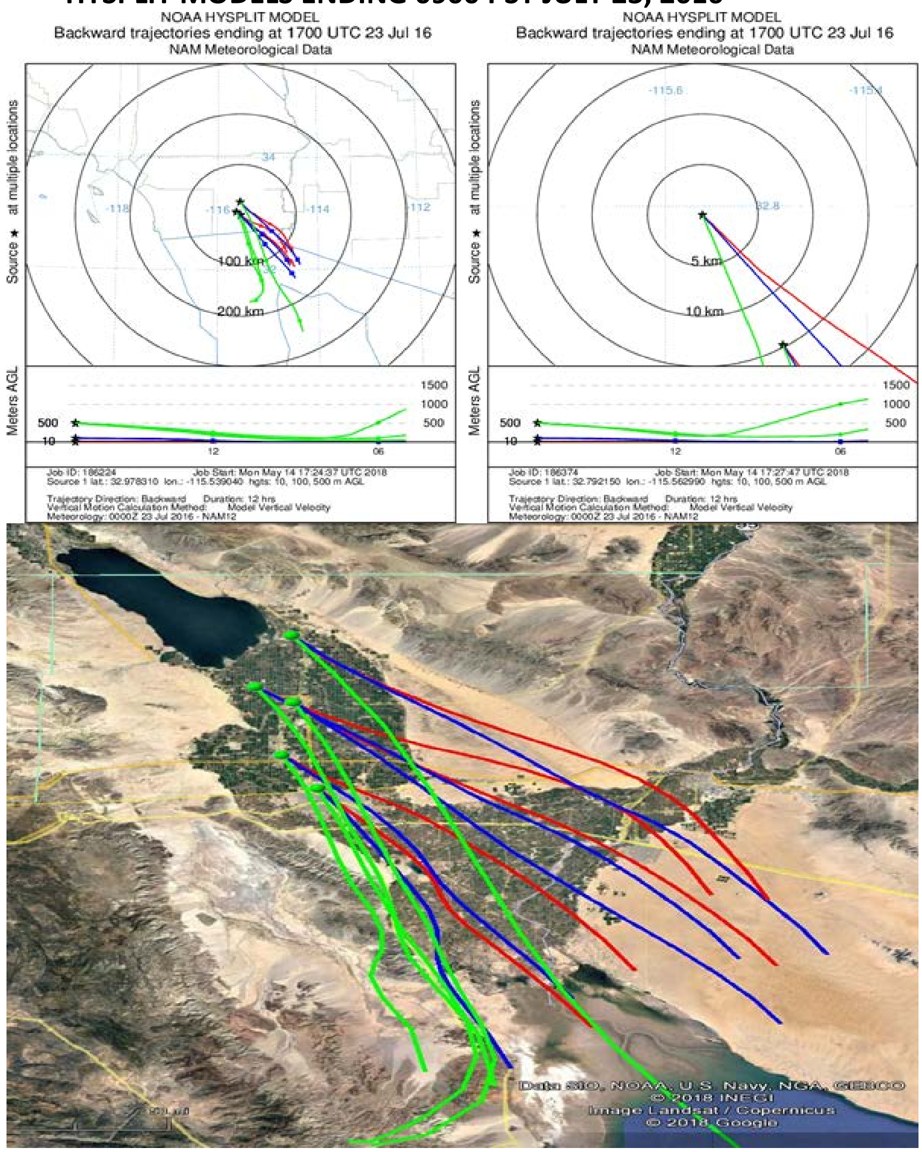


Fig 2-28: A 12-hour back-trajectory ending at 0900 PST on July 23, 2016. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-29
HYSPLIT MODELS ENDING 1900 PST JULY 23, 2016

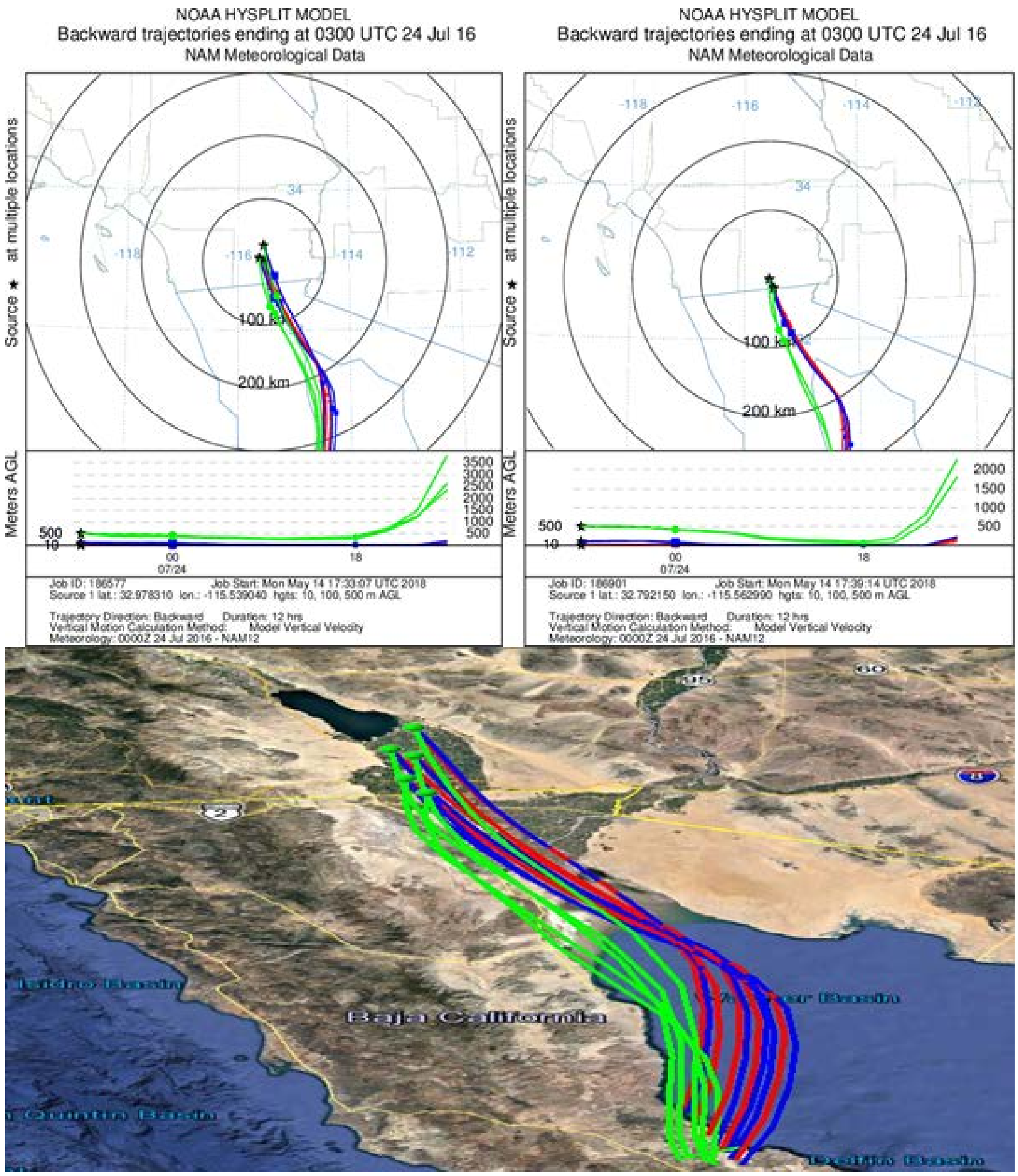


Fig 2-29: A 12-hour back-trajectory ending at 1900 PST on July 23, 2016. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-30
HYSPLIT MODELS ENDING 0900 PST JULY 24, 2016

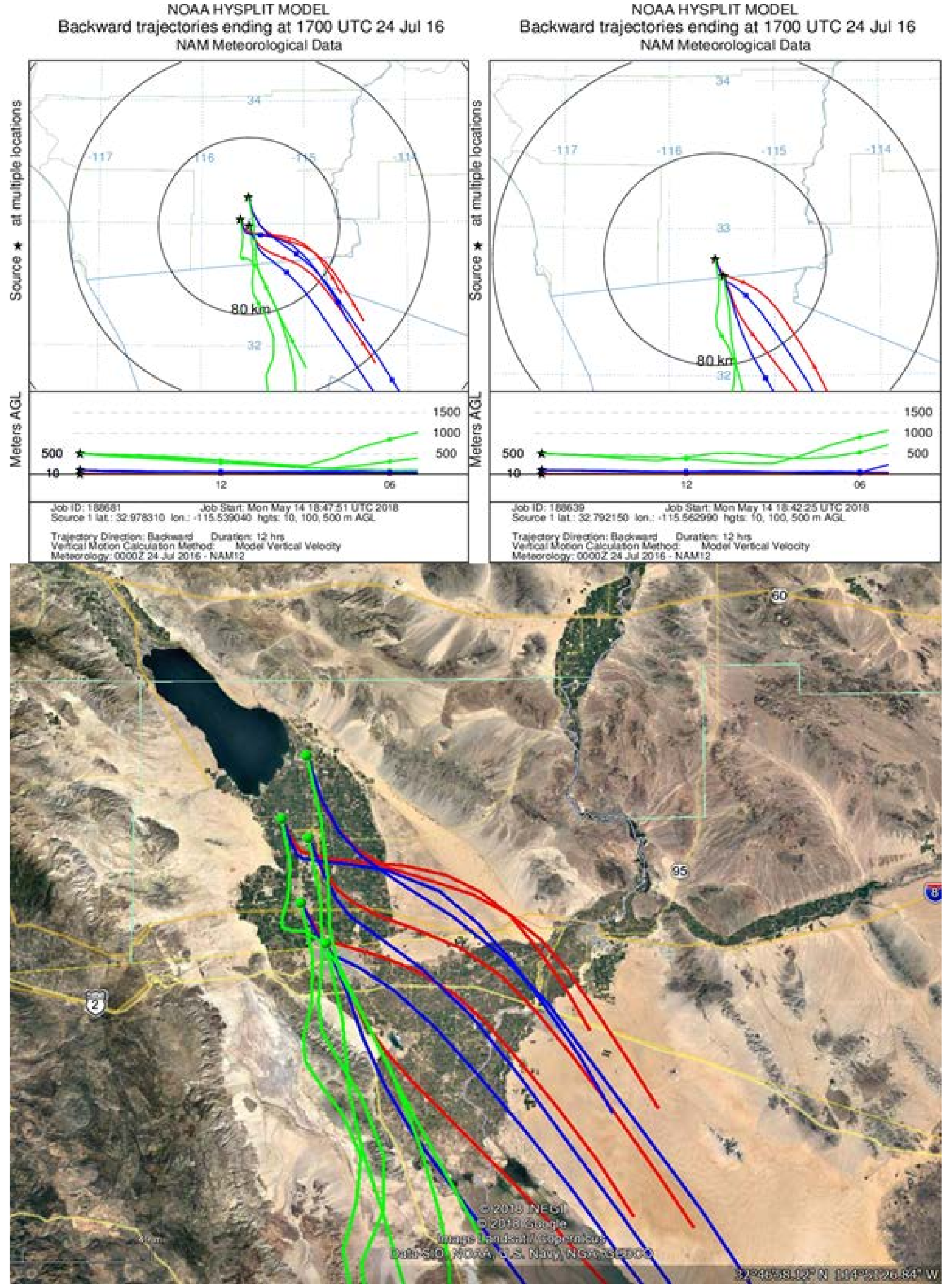


Fig 2-30: A 12-hour back-trajectory ending at 0900 PST on July 24, 2016. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-31
HYSPLIT MODELS ENDING 1700 PST JULY 24, 2016

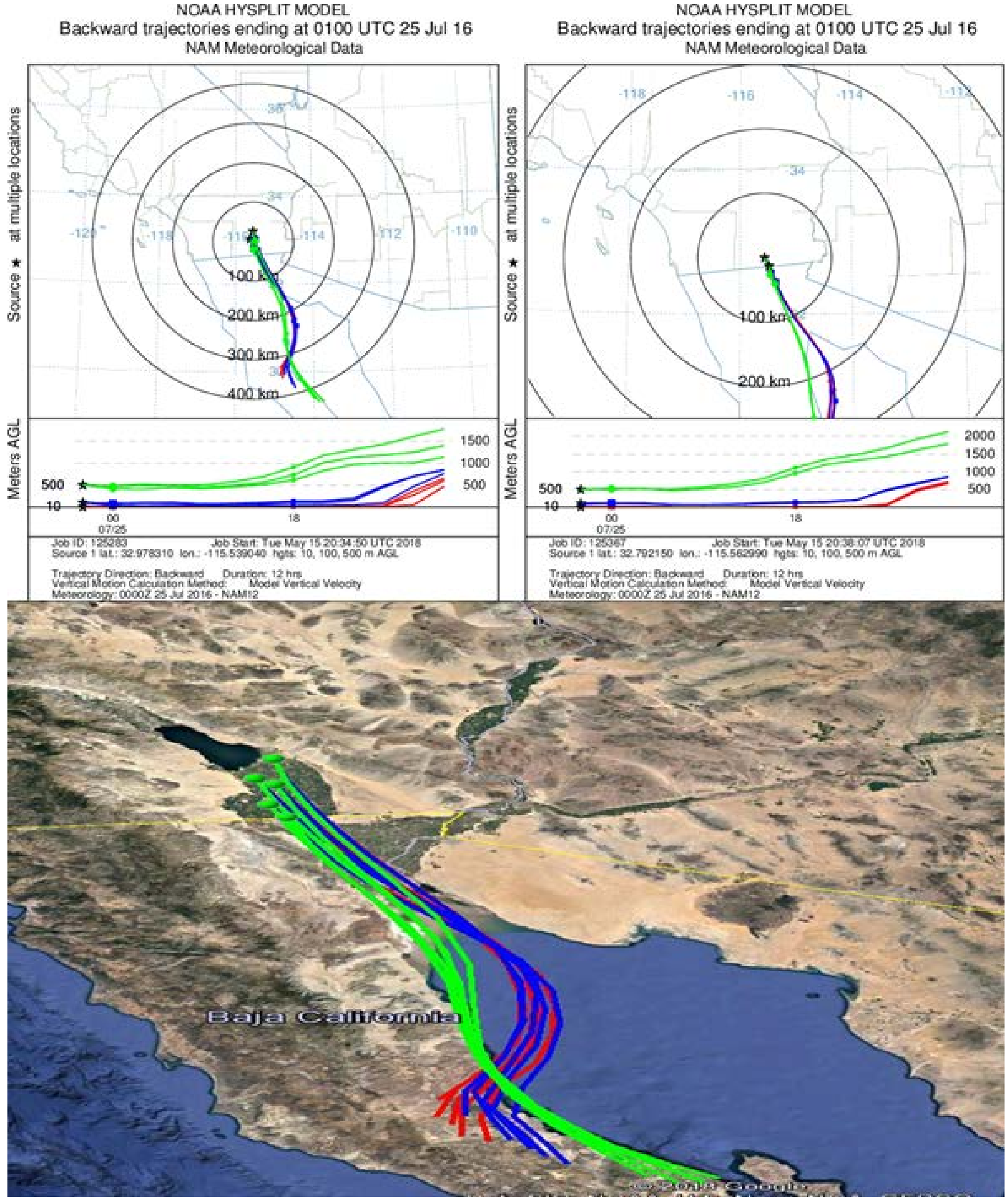


Fig 2-31: A 12-hour back-trajectory ending at 1700 PST on July 24, 2016. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-32 and 2-33 illustrate the elevated wind speeds and elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties for four days, July 22, 2016 through July 25, 2016. Elevated dust emissions transported into Imperial County affected the all air monitors in Imperial County when an unexpected gulf surge brought gusty southerly winds

July 23, 2016 through July 24, 2016. All air monitors measured hourly peak concentrations between 0700 am PST through 0900 am PST coincident with the elevated wind speeds at all stations, some measuring wind speeds and gusts above 25mph.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[12] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the July 23, 2016 and July 24, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-32
96-HOUR WIND SPEEDS AT VARIOUS SITES

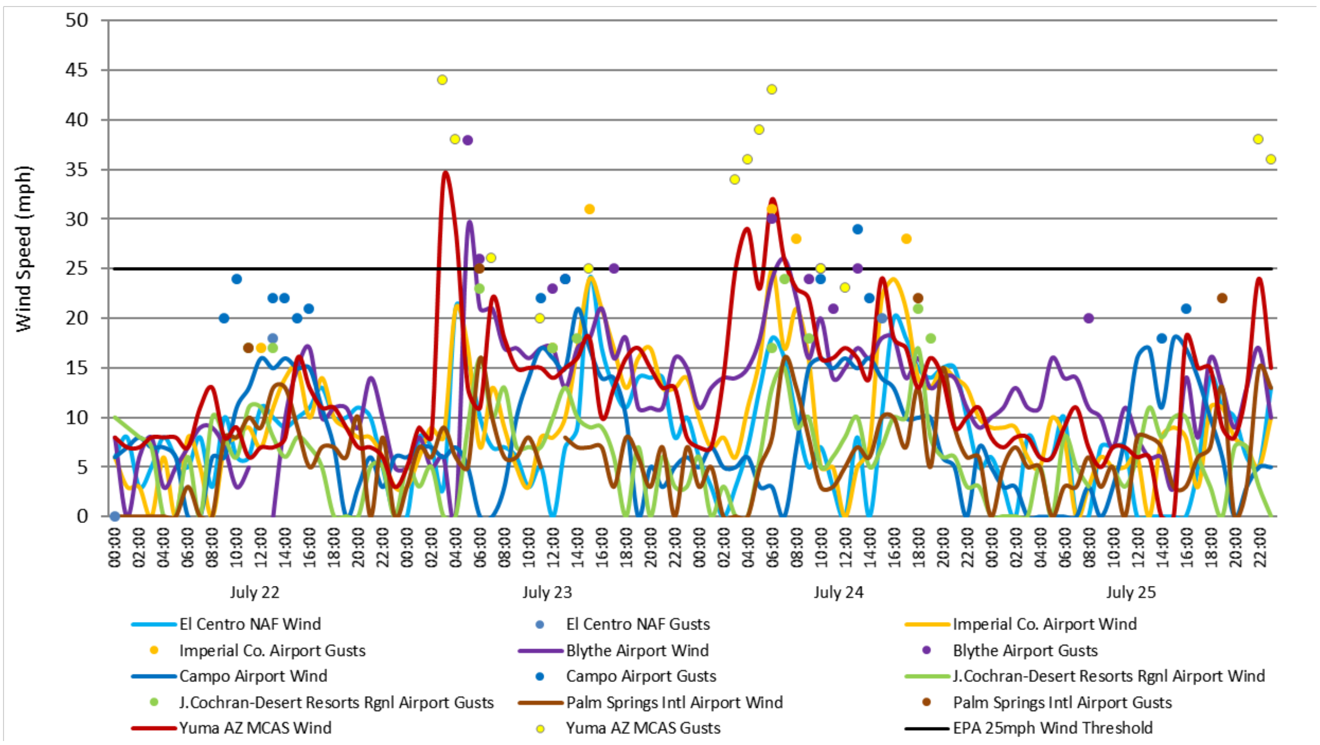


Fig 2-32: Is the graphical representation of the 96 hour measured winds speeds and gusts at regional airports in California and Arizona. The graph illustrates the regional effect of the wind event and the number of hours where measured wind speeds and wind gusts where above 25 mph. Wind Data from the NCEI's QCLCD system

[12] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-33
96-HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

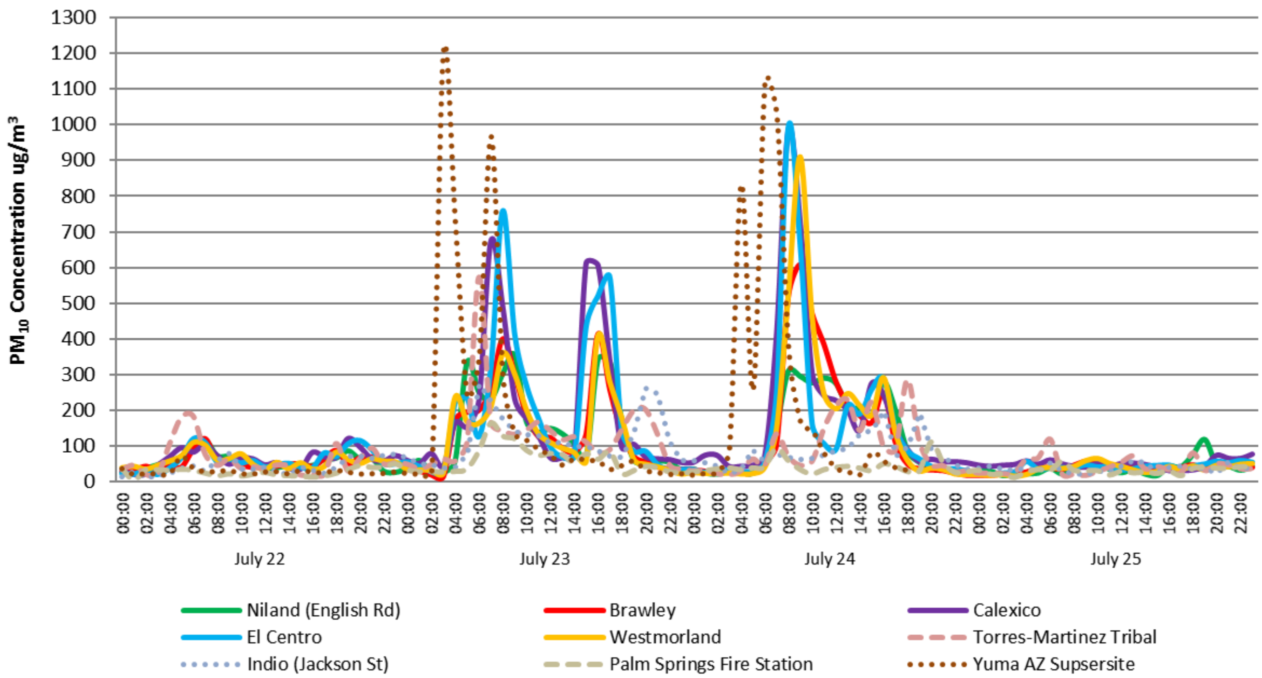


Fig 2-33: Is the graphical representation of the 96-hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at all sites on July 23, 2016 and July 24, 2016, demonstrate the regional effect of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley, Calexico, El Centro, and Westmorland monitors on July 23, 2016 and July 24, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the July 23, 2016 and July 24, 2016 high wind event and the exceedance measured at the Brawley, Calexico, El Centro, and Westmorland monitors.

Figures 3-1 through 3-8 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley, Calexico, El Centro, and Westmorland monitors for the period of January 1, 2010 through July 24, 2016. Note that prior to 2013, non-regulatory continuous BAM data was not reported into the AQS.[13] The use of time-series data graphs compiled and plotted 24-hour averaged PM_{10} concentrations between January 1, 2010 and July 24, 2016, help to establish the variability of the event as it occurred on July 23, 2016 and July 24, 2016. Although the discontinuation of FRM sampling at the El Centro and Westmorland monitors had an effective date of December 31, 2015 FEM sampling commenced July 15, 2015 at both the El Centro and Westmorland stations. Similarly, FRM sampling in Calexico was discontinued January, 19 2016 any event, all eight figures illustrate that the exceedance, which occurred on July 23, 2016 and July 24, 2016, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[13] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO JULY 24, 2016

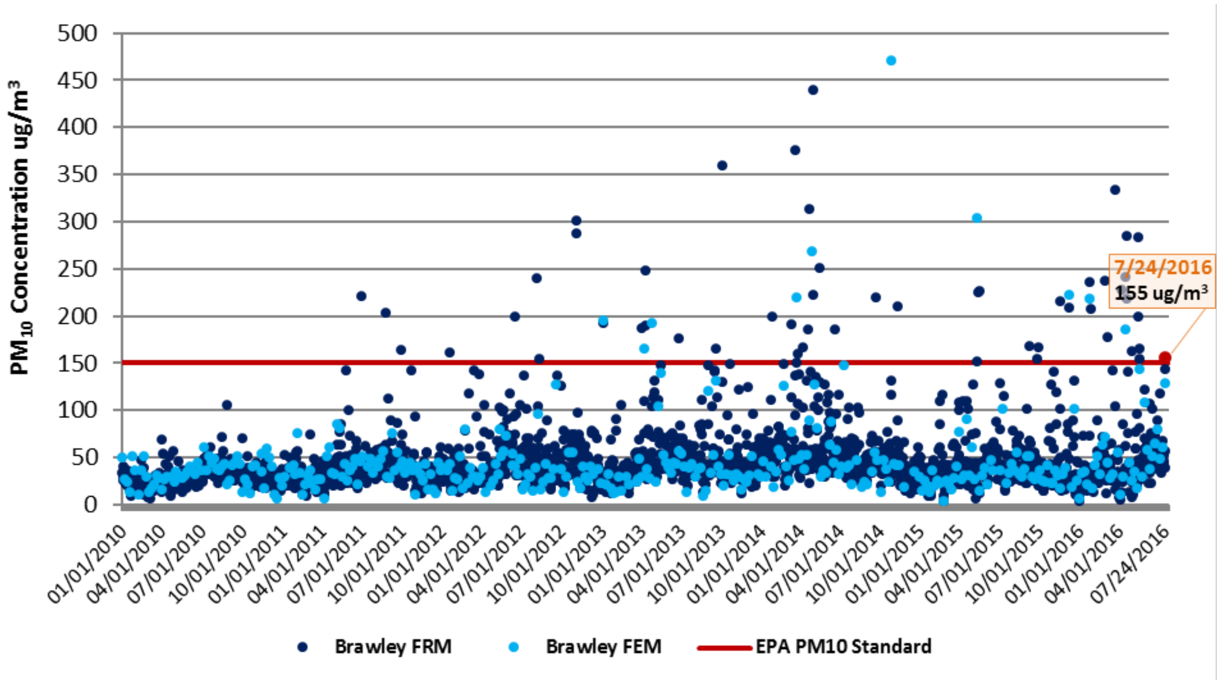


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 155 µg/m^3 as measured on July 24, 2016 by the Brawley monitor was outside the normal historical concentrations when compared to similar days and non-event days. Of the 2,397 sampling days, there were 52 exceedance days, which is less than a 2.5% occurrence rate

FIGURE 3-2
CALEXICO HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO JULY 24, 2016

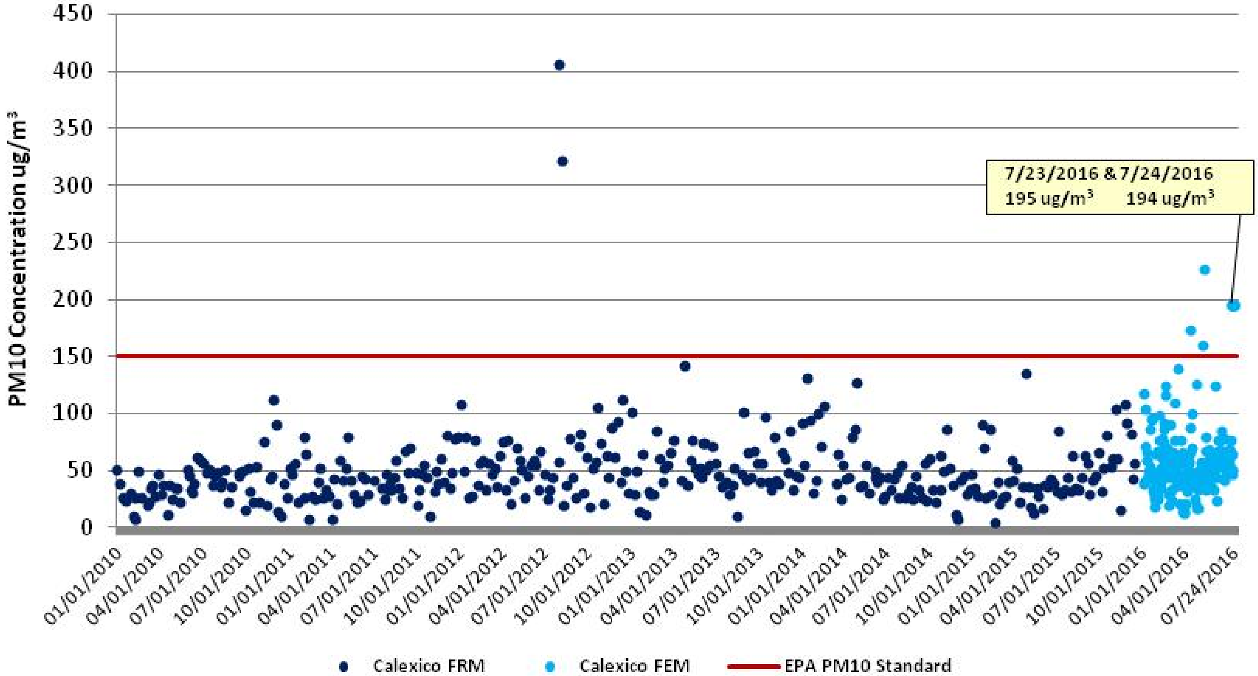


Fig 3-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 195 µg/m^3 and 194 µg/m^3 as measured on July 23, 2016 and July 24, 2016 by the Calexico monitor were outside the normal historical concentrations when compared to similar days and non-event days. Of the 563 sampling days, there were 8 exceedance days, which is less than a 1.5% occurrence rate

FIGURE 3-3
EL CENTRO HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO JULY 24, 2016

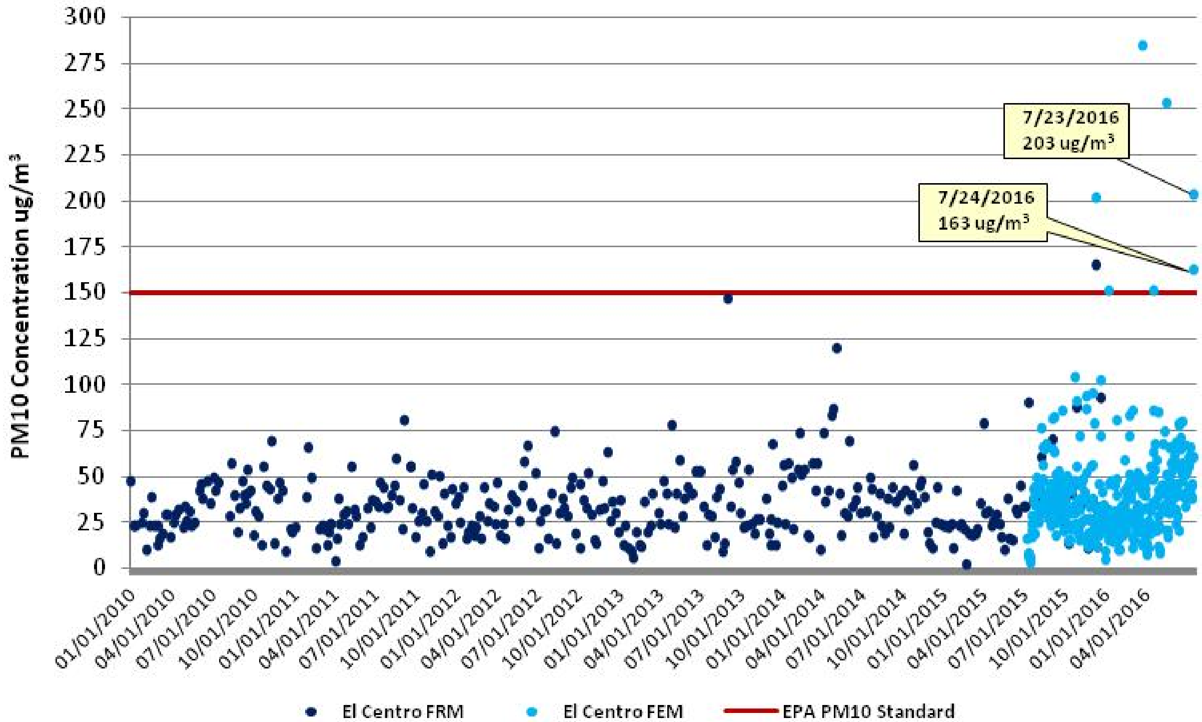


Fig 3-3: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 203 µg/m^3 and 162 µg/m^3 as measured on July 23, 2016 and July 24, 2016 by the El Centro monitor were outside the normal historical concentrations when compared to similar days and non-event days. Of the 713 sampling days, there were 5 exceedance days, which is less than a 1% occurrence rate

FIGURE 3-4
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO JULY 24, 2016

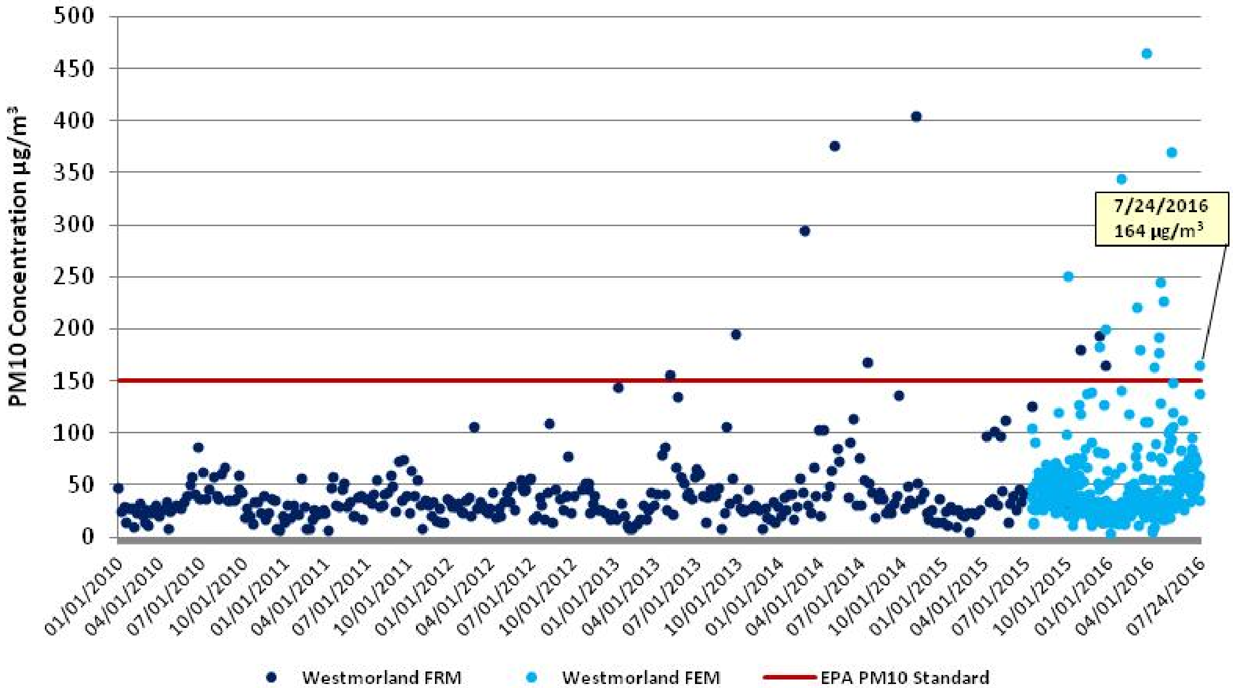
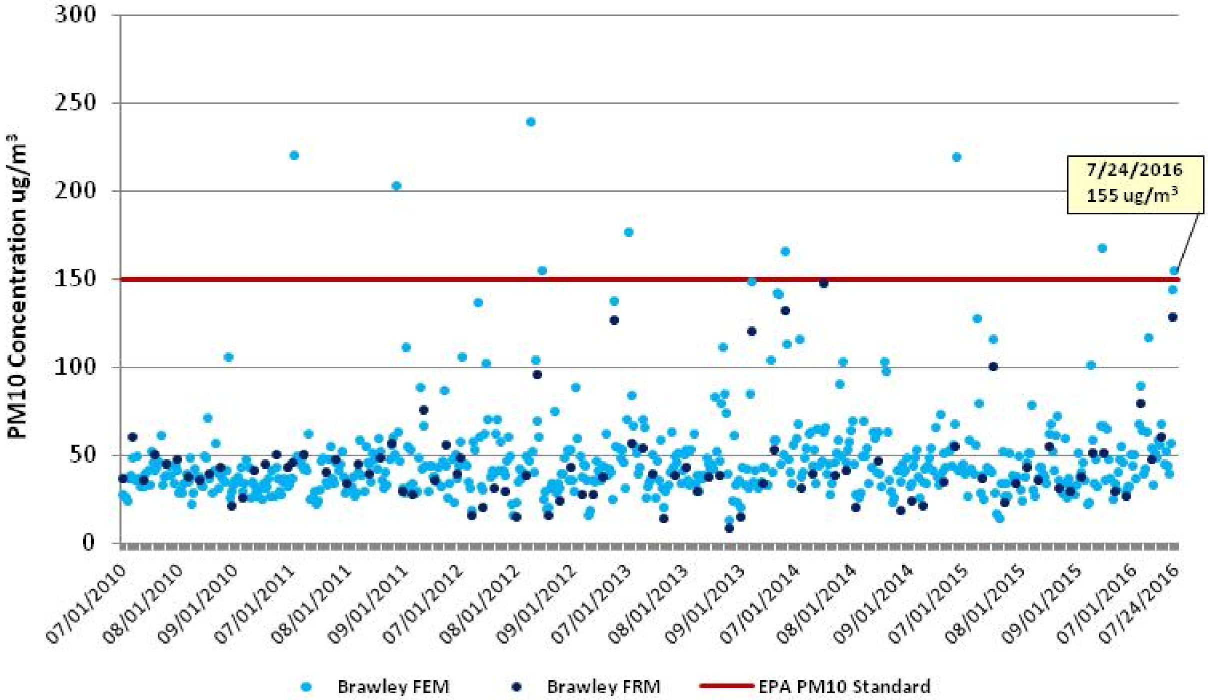


Fig 3-4: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 164 µg/m^3 as measured on July 24, 2016 by the Westmorland monitor was outside the normal historical concentrations when compared to similar days and non-event days. Of the 713 sampling days, there were 21 exceedance days, which is less than a 3% occurrence rate

The time series, **Figures 3-1 thru 3-4** for the Brawley, Calexico, El Centro, and Westmorland monitors included 2,397 sampling days (January 1, 2010 through July 24, 2016). During the January 1, 2010 through July 24, 2016 period the Brawley, Calexico, El Centro, and Westmorland monitors measured 4,796 combined credible samples.

Overall, the time series illustrates that the Brawley, Calexico, El Centro, and Westmorland monitors, measured 86 exceedance days out of the 2,397 sampling days, which is less than a 4% occurrence rate. Of the 86-exceedance days, 17 exceedance days occurred during the third quarter (July – September). The remaining 69 exceedance days occurred during the first, second and fourth quarters. The July 23, 2016 and July 24, 2016 concentrations are outside the normal historical measurements for the third quarter. No exceedances of the standard occurred during 2010. As mentioned above, FEM BAM data was not regulatory from 2010 to 2012.

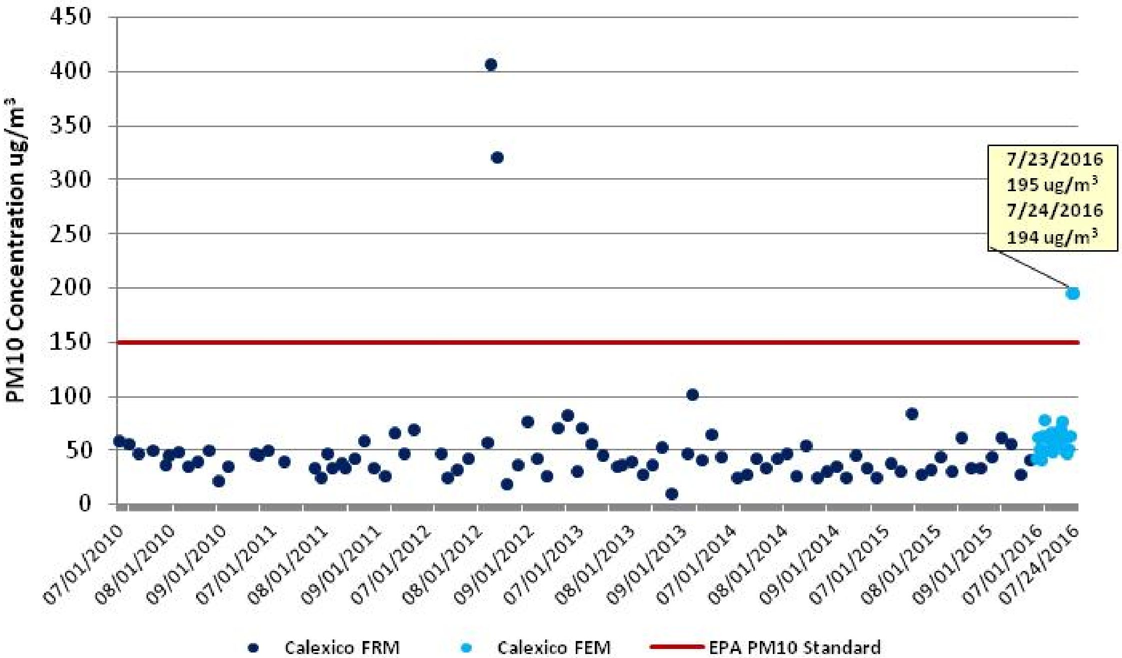
FIGURE 3-5
BRAWLEY SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 30, 2016**



***July 1, 2010 through September 30, 2015 and July 1, 2016 through July 24, 2016**

Fig 3-5: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 155 µg/m^3 as measured on July 24, 2016 by the Brawley monitor was outside the normal seasonal measurements. Of the 667 credible samples measured within 576 sampling days only 8 exceedance days occurred or a less than a 1.5% occurrence rate

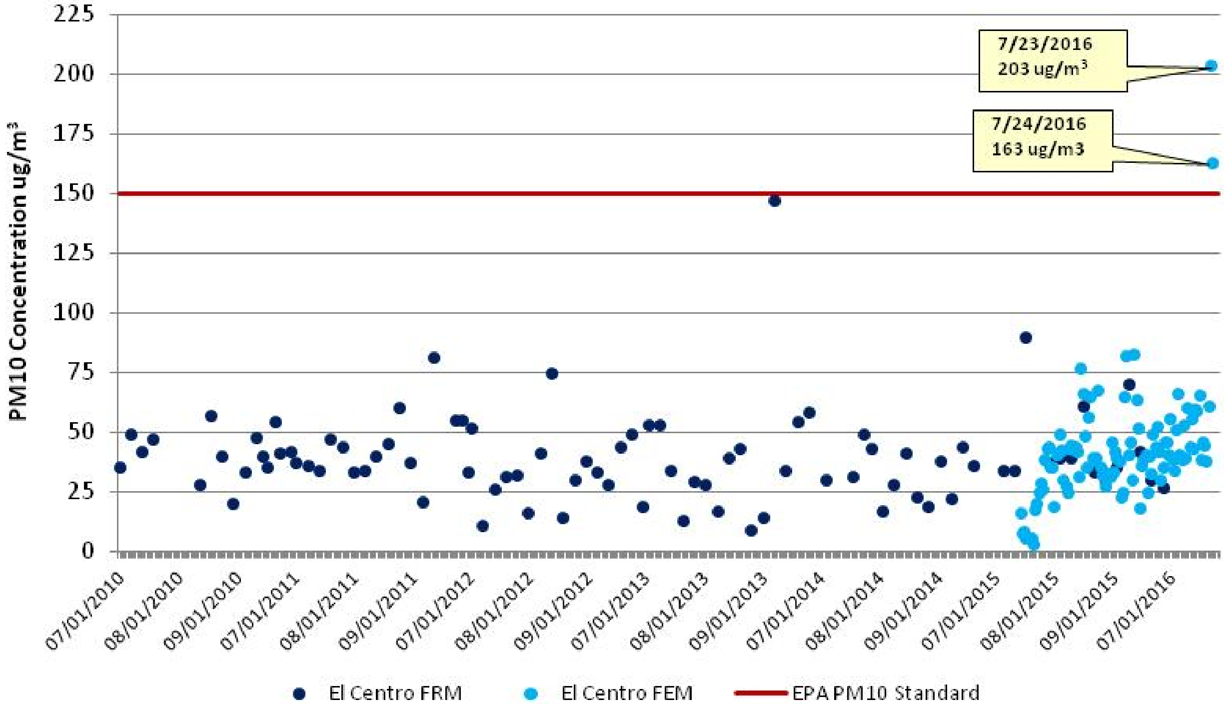
FIGURE 3-6
CALEXICO SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 30, 2016**



***July 1, 2010 through September 30, 2015 and July 1, 2016 through July 24, 2016**

Fig 3-6: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations 195 µg/m^3 and 194 µg/m^3 as measured on July 23, 2016 and July 24, 2016 by the Calexico monitor was outside the normal seasonal measurements. Of the 113 credible samples measured within 117 sampling days only 4 exceedance days occurred or a less than a 3.5% occurrence rate

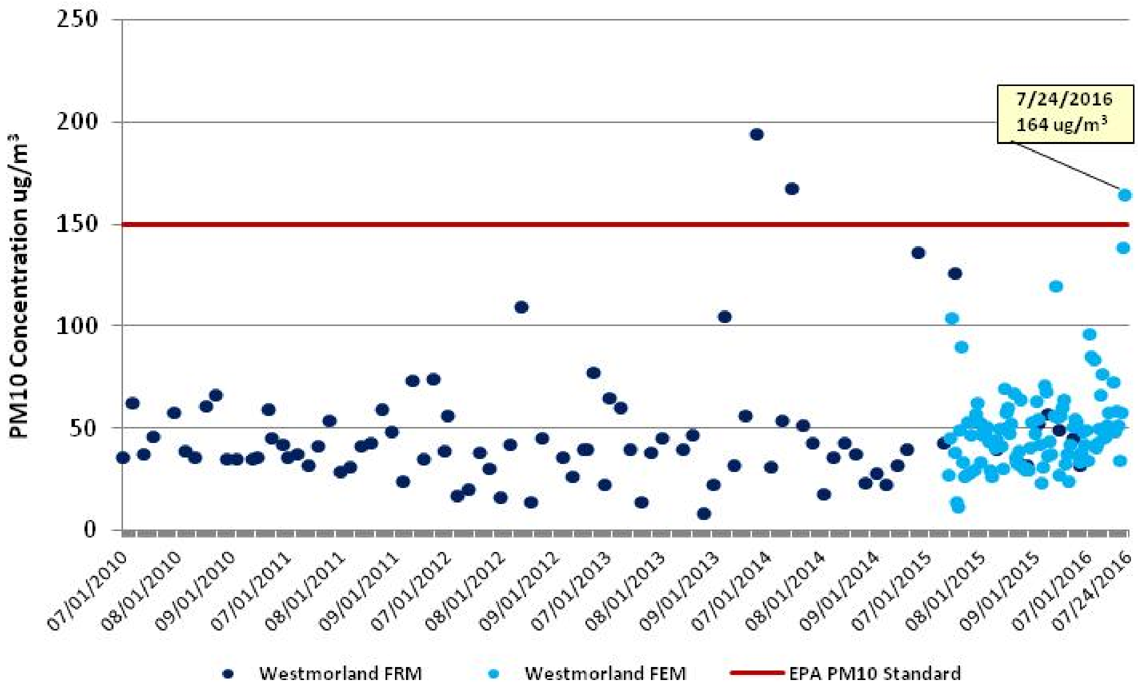
FIGURE 3-7
EL CENTRO SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 30, 2016**



***July 1, 2010 through September 30, 2015 and July 1, 2016 through July 24, 2016**

Fig 3-7: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations of 203 µg/m^3 and 162 µg/m^3 as measured on July 23, 2016 and July 24, 2016 by the El Centro monitor were outside the normal seasonal measurements. Of the 191 credible samples measured within 182 sampling days only 2 exceedance days occurred or a less than a 1.5% occurrence rate

FIGURE 3-8
WESTMORLAND SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 30, 2016**



***July 1, 2010 through September 30, 2015 and July 1, 2016 through July 24, 2016**

Fig 3-8: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations of 164 µg/m^3 as measured on July 24, 2016 by the Westmorland monitor was outside the normal seasonal measurements. Of the 192 credible samples measured within 182 sampling days only 3 exceedance days occurred or a less than a 2% occurrence rate

Figures 3-5 through 3-8 display the seasonal fluctuations over 576 sampling days at the Brawley, Calexico, El Centro, and Westmorland monitors for months July 1, 2010 through September 30, 2015 and July 1, 2016 through July 24, 2016. The combined seasonal sampling period for Brawley, Calexico, El Centro and the Westmorland monitors had 1,163 credible samples measured within 576 sampling days and eight (8) exceedances or a less than a 1.5% occurrence rate.

FIGURE 3-9
BRAWLEY HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH JULY 24, 2016

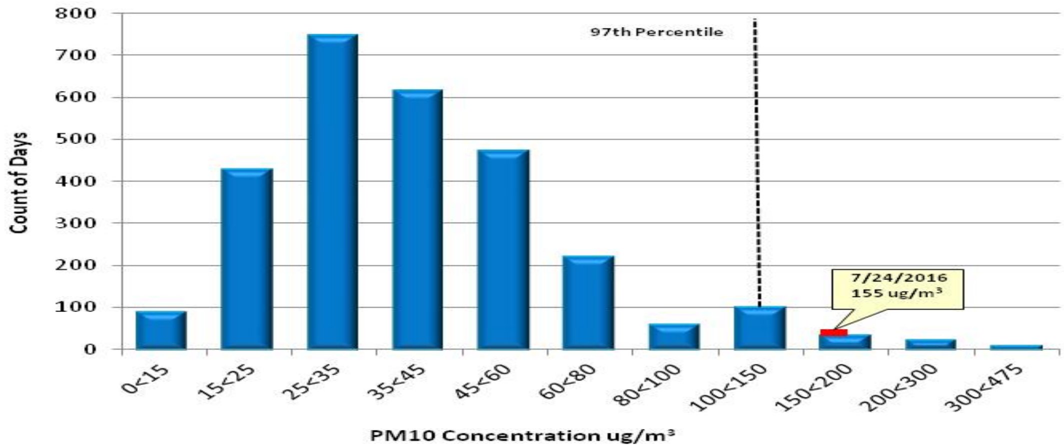


Fig 3-9: The 24-hr average PM_{10} concentrations measured at the Brawley monitoring site demonstrates that the concentration of 155 µg/m^3 as measured during the July 24, 2016 event was in excess of the 97th percentile

FIGURE 3-10
CALEXICO HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH JULY 24, 2016

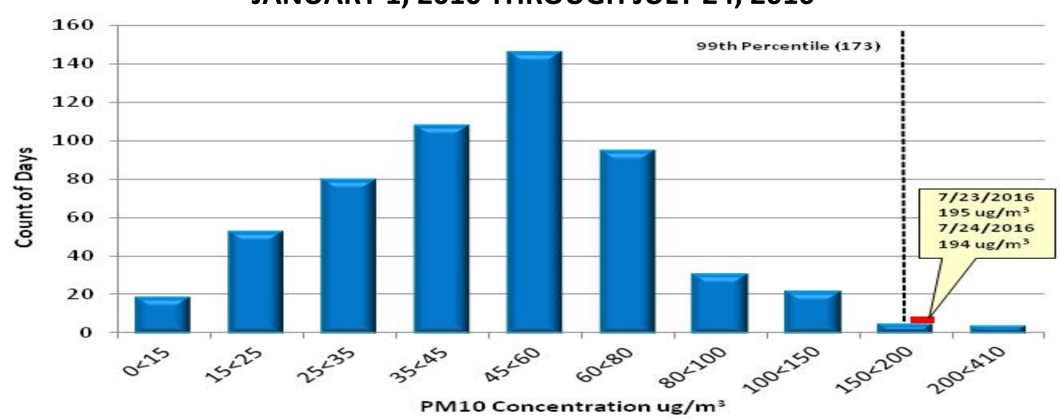


Fig 3-10: The 24-hr average PM_{10} concentrations at the Calexico monitoring site demonstrates that the concentrations of 195 µg/m^3 and 194 µg/m^3 as measured by the Calexico monitor on July 24, 2016 were in excess of the 99th percentile

FIGURE 3-11
EL CENTRO HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH JULY 24, 2016

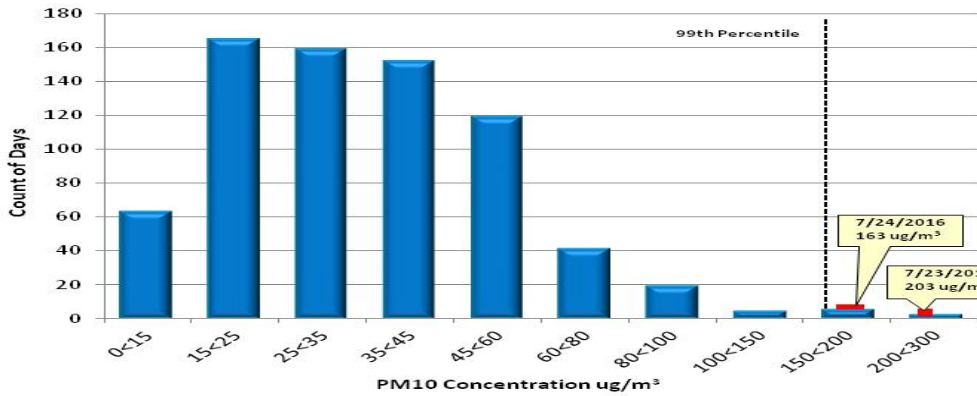


Fig 3-11: The 24-hr average PM_{10} concentrations at the El Centro monitoring site demonstrates that the concentrations of 203 µg/m³ and 162 µg/m³ as measured by the El Centro monitor on July 23, 2016 and July 24, 2016 were in excess of the 99th percentile

FIGURE 3-12
WESTMORLAND HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH JULY 24, 2016

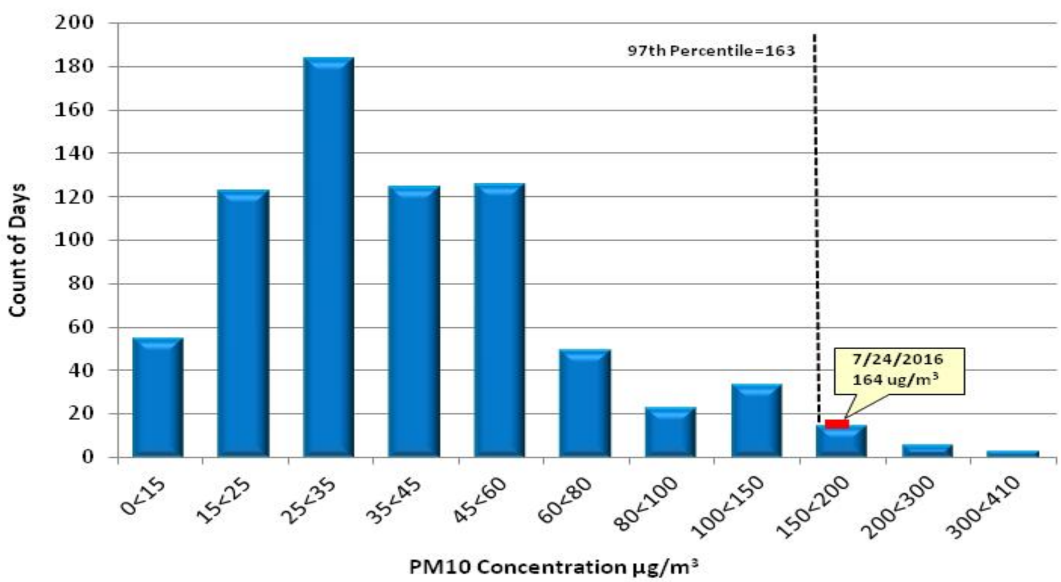


Fig 3-12: The 24-hr average PM_{10} concentrations at the Westmorland monitoring site demonstrates that the concentration of 164 µg/m³ as measured by the Westmorland monitor on July 24, 2016 was in excess of the 99th percentile

For the combined FRM and FEM data sets the annual historical and the seasonal historical PM_{10} concentrations of 155 µg/m^3, 195 µg/m^3, 194 µg/m^3, 203 µg/m^3, 162 µg/m^3, and 164 µg/m^3 measured by the Brawley, Calexico, El Centro, and Westmorland are above the 97th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings, for both the historical and seasonal patterns for the July 23, 2016 and the July 24, 2016 measured exceedances of 155 µg/m^3, 195 µg/m^3, 194 µg/m^3, 203 µg/m^3, 162 µg/m^3, and 164 µg/m^3 are clearly outside the normal concentration levels when comparing to event days and non-event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentrations observed on July 23, 2016 and July 24, 2016 occur infrequently. When comparing the measured PM_{10} levels on July 23, 2016 and July 24, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley, Calexico, El Centro, and Westmorland monitors were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the July 23, 2016 and July 24, 2016 natural event affected the concentrations levels at the Brawley, Calexico, El Centro, and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on July 23, 2016 and July 24, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures to be enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for July 23, 2016 and July 24, 2016. In addition, this July 23, 2016 and July 24, 2016 demonstration provides technical and non-technical evidence that an unexpected Gulf Surge caused gusty southerly winds to blow across natural open deserts within northern Mexico, including northern Baja California, and into Imperial County. The windblown dust from the Gulf Surge suspended particulate matter on July 23, 2016 and July 24, 2016, which affected the Brawley, Calexico, El Centro, and Westmorland, monitors. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the July 23, 2016 and July 24, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

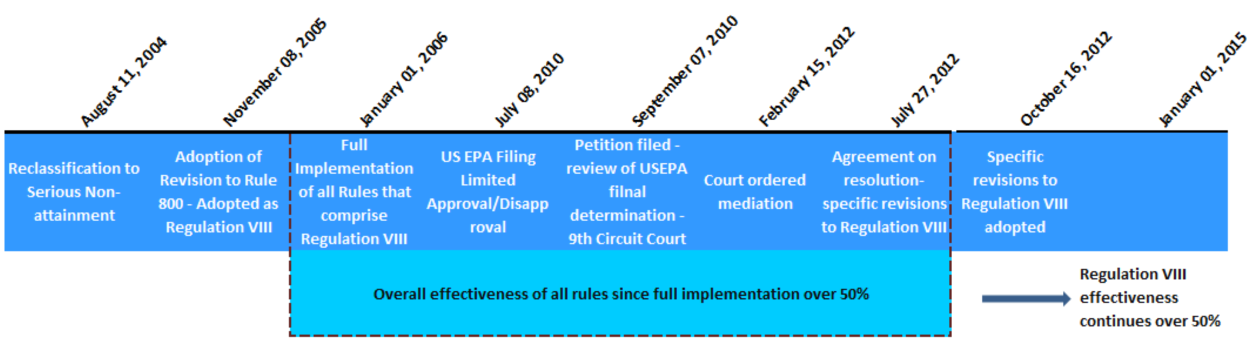


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

Below is a brief summary of Regulation VIII, which is comprised of seven fugitive dust rules. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On July 23 and July 24, 2016 the ICAPCD declared a No Burn day **(Appendix A).** No complaints were filed for agricultural burning on July 23 and July 24, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database were compiled and reviewed for active permitted sources throughout Imperial County and specifically around the Brawley, Calexico, El Centro, and Westmorland monitors during the July 23, 2016 and July 24, 2016 PM_{10} exceedances. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on July 23, 2016 nor July 24, 2016, officially declared no burn days, related to agricultural burning, waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

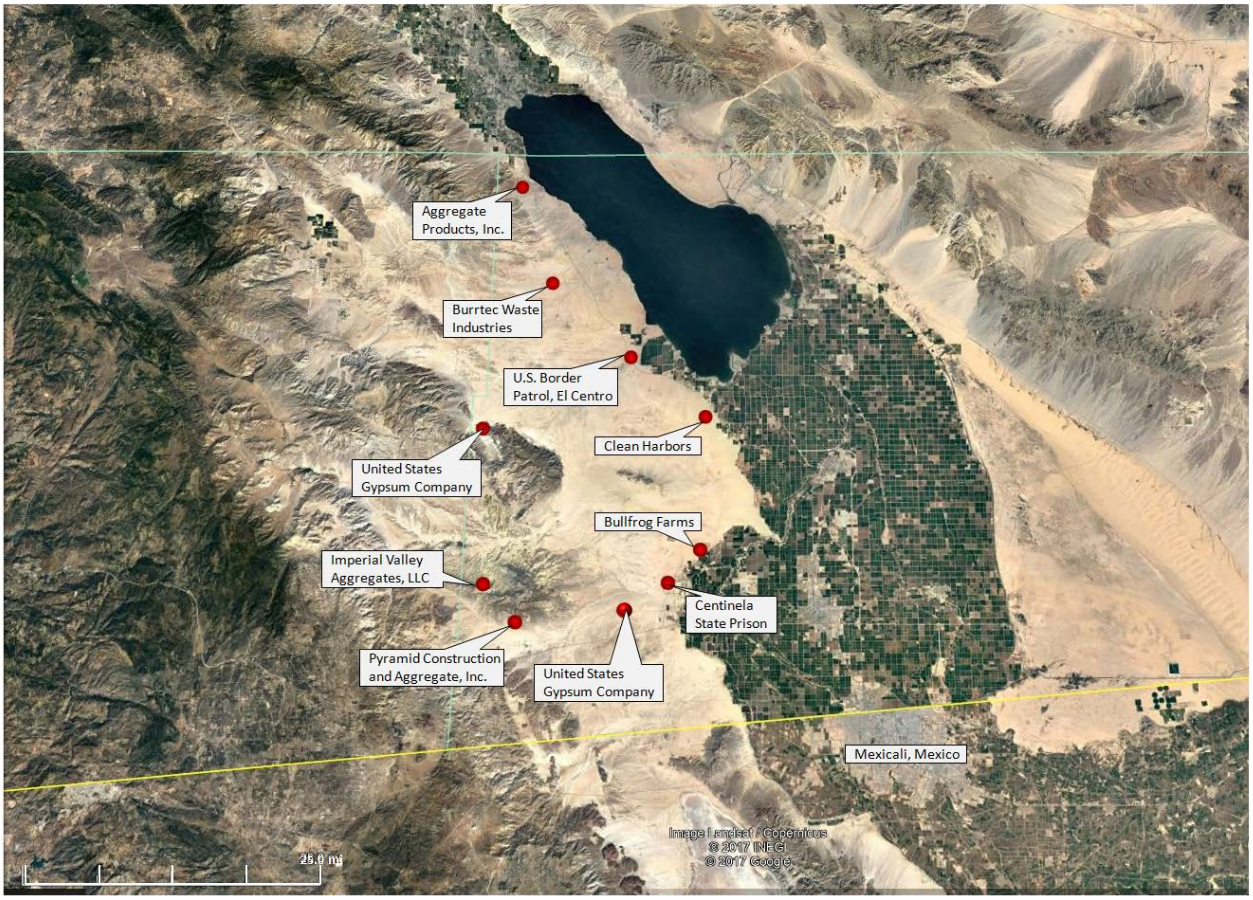


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley, Calexico, El Centro and Westmorland monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

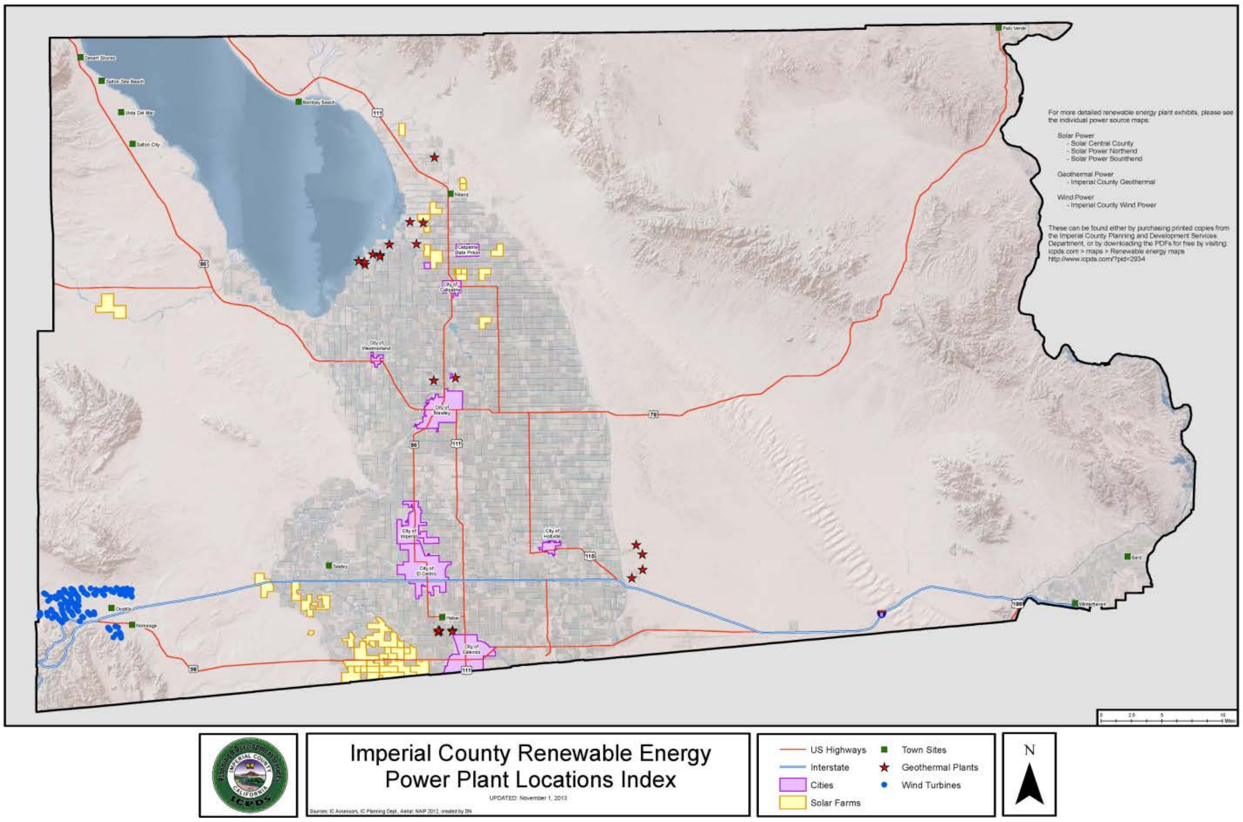


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley, Calexico, El Centro and Westmorland monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

An unexpected Gulf Surge caused the July 23, 2016 and July 24, 2016 event. As such, the ICAPCD nor the NWS issued warnings or forecast information prior to the actual event. Because it was an unexpected Gulf Surge, current information was provided hours after the Gulf Surge entered the region. Therefore, no issued forecast or warning occurred. What the ICAPCD provided was a publication of forecast information from the NWS for July 22, 2016 through July 25, 2016. The published notification, via the ICAPCD's webpage, forecast included the intrusion of monsoonal moisture into southeast California for the following week, not the July 23, 2016 and July 24, 2016 weekend. The big story was the heat. There was a slight hint that temperatures could cool on Sunday, July 24, 2016, as thunderstorm chances would potentially return. However, because the Gulf Surge that caused the gusty windy conditions was unexpected no published warning was possible. **Appendix A** contains copies of notices pertinent to the July 23, 2016 and July 24, 2016 event.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Data were also collected from automated meteorological instruments that were upstream from the Brawley, Calexico, El Centro, Niland, and Westmorland monitors during the wind event. On July 23, 2016 the Yuma, Arizona MCAS (KNYL) measured winds above 25 mph for two hours with peak gusts of 44 mph, and winds at or above 25 mph for four hours (with gusts of 43 mph) on July 24, 2016.

Mexicali, Mexico International Airport (MMML) reported multiple observations of blowing dust at the airport on both days. On July 24, 2016, the airport measured one hour of winds above 25 mph with multiple observations of blowing dust. Locally, the Imperial County Airport (KIPL) measured one hour of winds just under 25 mph on July 23, 2016, but with gusts reaching 31 mph. On July 24, 2016, the airport measured one hour of winds at 25 mph with a second hour just under the threshold. Gusts reached 31 mph. San Luis Colorado, Mexico, another upstream location, measured multiple hours of gusts 30 mph or greater on July 23, 2016. On July 24, 2016 the station measured one hour of winds at 25 mph with a peak gust of 40 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the July 23, 2016 and July 24, 2016 event wind speeds were at or above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined within this document demonstrate that gusty winds caused by arrival of an unexpected Gulf Surge moved northward into southeast California transporting windblown dust that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of the Brawley, Calexico, El Centro, and Westmorland monitors during the event were high enough (at or above 25 mph, with wind gusts of 43 and 44 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on July 23, 2016 and July 24, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the gusty wind event timeline and geographic locations. The July 23, 2016 and July 24, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for July 23, 2016 and July 24, 2016 identified the intrusion of an unexpected Gulf Surge, caused in all likelihood by meteorological events associated with tropical storm “Frank". As discussed above, an unexpected occurrence of tropical storm outflow boundaries moved out of Mexico, up Baja California and into the southwest. While the NWS offices, in San Diego and Phoenix did not expect the Gulf Surge or remnant effects from the tropical storms located in Mexico the Servicio Meteorológico Nacional (SMN) in Mexico closely tracked the formation of tropical storms “Georgette” and “Frank.” Both storms formed within days of each other and turned into hurricanes intensifying in strength Saturday, July 23, 2016 through Sunday, July 24, 2016. Of the two hurricanes, “Frank” was the closest to Baja California.

By Saturday July 23, 2016, the Phoenix NWS office reported a “surprise.” The issued area forecast discussion identified “an old and distantly traveled convective outflow boundary” that moved out of Mexico and into southern Arizona and a weak boundary that moved through Phoenix with southerly gusts measured at Yuma and Blythe. Likewise, the San Diego NWS office identified the gulf surge affecting the lower deserts, such as Thermal. As updates were made to the area forecast discussions, the Phoenix NWS office identified “[s]trong outflow and outflow driven Gulf surge” with persisting strong south to southeasterly gusty winds and hazy conditions throughout the evening of July 23, 2016 and continuing through Sunday, July 24, 2016. Both offices describe a large convective complex over northwest Mexico moving westward across northern Baja potentially affecting western Arizona (Yuma) and southeastern California (Blythe and Imperial).

Entrained windblown dust from natural areas, particularly from the natural open desert areas south-to-southeast of Imperial County, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations on July 23, 2016 and July 24, 2016.

Figure 5-1 is a satellite image from GOES-East (16) and GOES-West (15) satellites which shows the clouds associated with the tropical storms located in Mexico.

FIGURE 5-1
GOES EAST AND GOES WEST SATELLITE IMAGE JULY 24, 2016

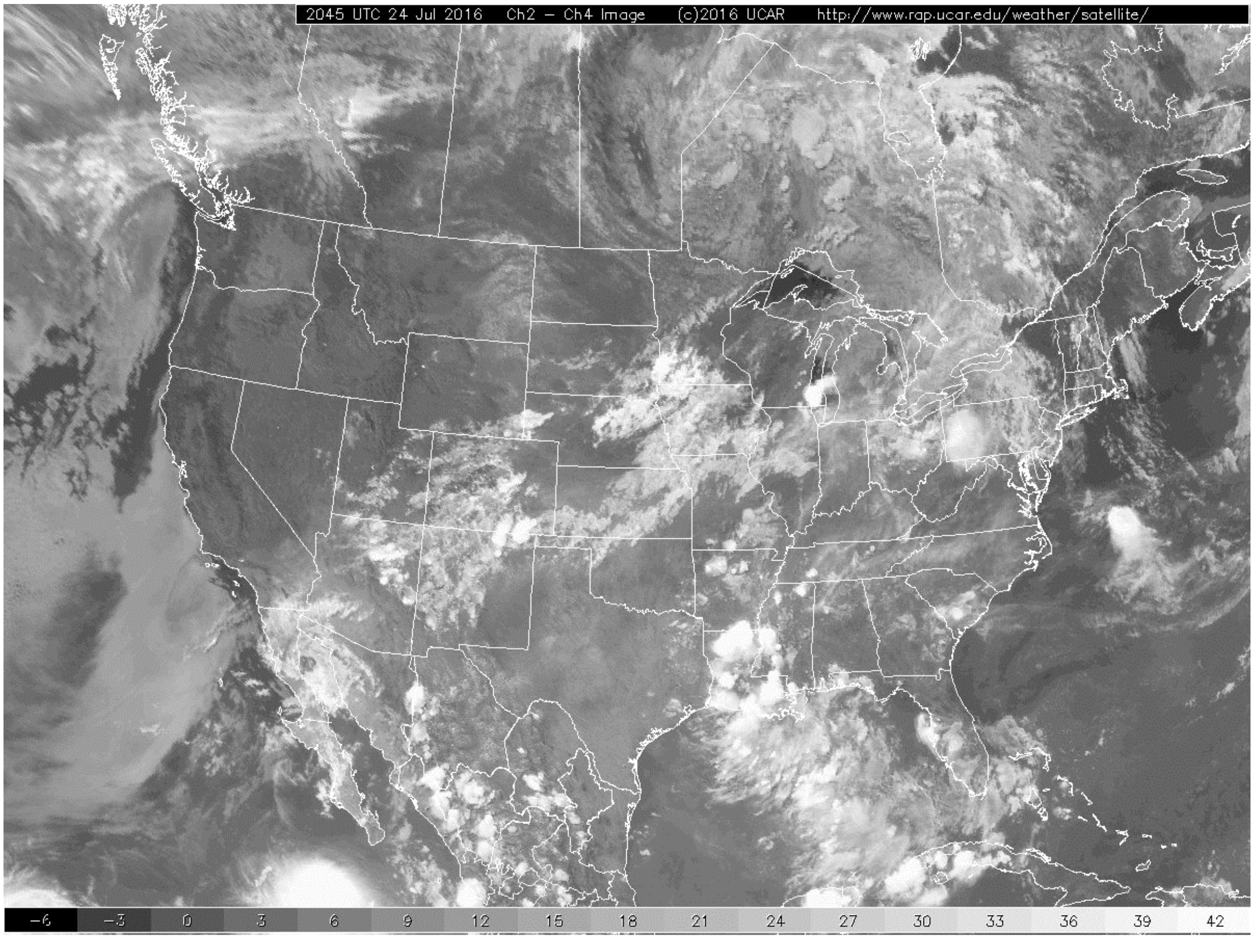


Fig 5-1: A satellite image (channels 2-4) captured at 0845 PST on July 24, 2016 shows the clouds as they extend into southeastern California. Source: http://weather.rap.ucar.edu/satellite

Figure 5-2 and Figure 5-3 shows the Aerosol Optical Depth (AOD)[14] over Imperial County captured by the MODIS instrument onboard the Terra satellite on Saturday, July 23, 2016 and Sunday, July 24, 2016. These images utilize the Deep Blue Aerosol Angstrom Exponent [15] to

[14] **Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness**) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov.

[15] The **MODIS Deep Blue Aerosol Ångström Exponent** layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke) https://worldview.earthdata.nasa.gov; The Ångström Exponent (denoted as AE

measure the AOD. This is useful in showing heavier aerosols that can indicate dust. As seen from the images, there was a heavy layer of relatively thick aerosol particles over the area on July 23, 2016.

FIGURE 5-2
TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY JULY 23, 2016

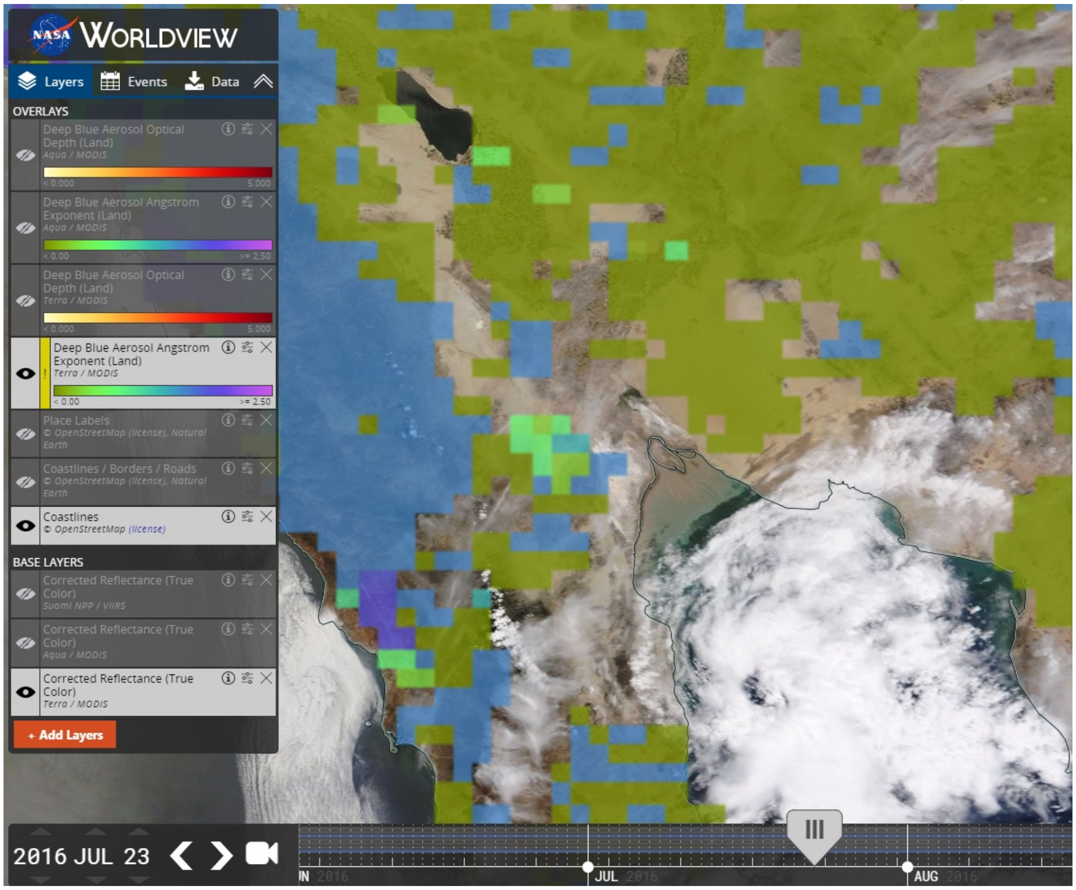


Fig 5-2: The MODIS instrument onboard the Terra satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~10:30 PST on July 23, 2016. Green colors indicate thicker aerosols that are more likely dust. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

or α) is a measure of how the AOD changes relative to the various wavelength of light (known as 'spectral dependence'.) This is related to the aerosol particle size. Roughly speaking, values less than 1 suggest an optical dominance of coarse particles (e.g. dust, ash, sea spray), while values greater than one 1 dominance of fine particles (e.g. smoke, industrial pollution); https://deepblue.gsfc.nasa.gov/science.

FIGURE 5-3
TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY JULY 24, 2016

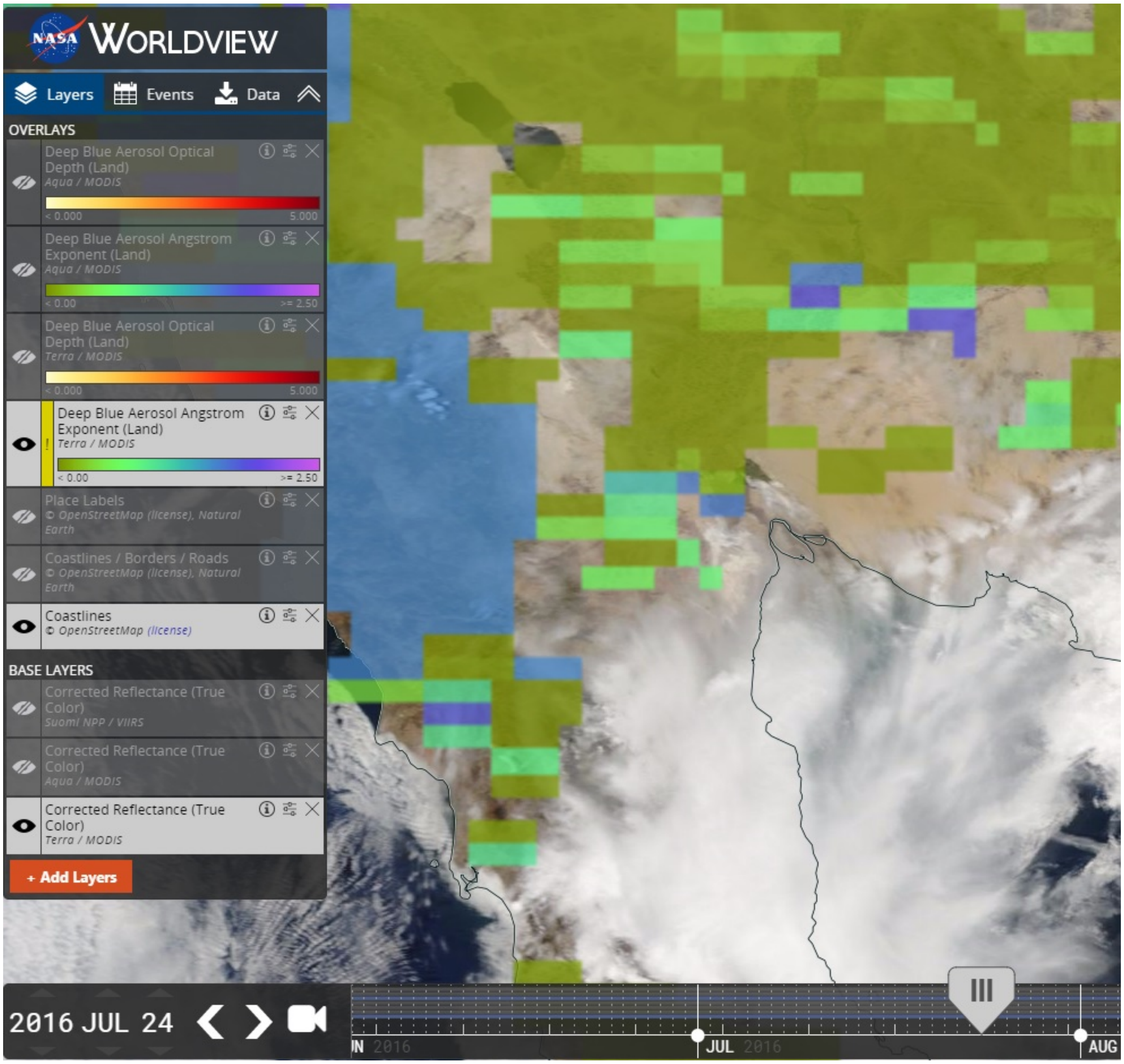


Fig 5-3: The MODIS instrument onboard the Terra satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~10:30 PST on July 24, 2016. Green colors indicate thicker aerosols that are more likely dust. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

Figure 5-4 and 5-5 are NEXRAD base reflectivity images captured by the Yuma, Arizona (KYUX) station on July 23, 2016 and July 24, 2016. Although NEXRAD coverage is only available for the far southeastern portion of Imperial County, it does provide a general idea of the strength of the weather system. The outflow boundaries associated with the Gulf Surge generated gusty winds during the early morning hours on both days that transported windblown dust into Imperial County.

FIGURE 5-4
NEXRAD BASE REFLECTIVITY JULY 23, 2016

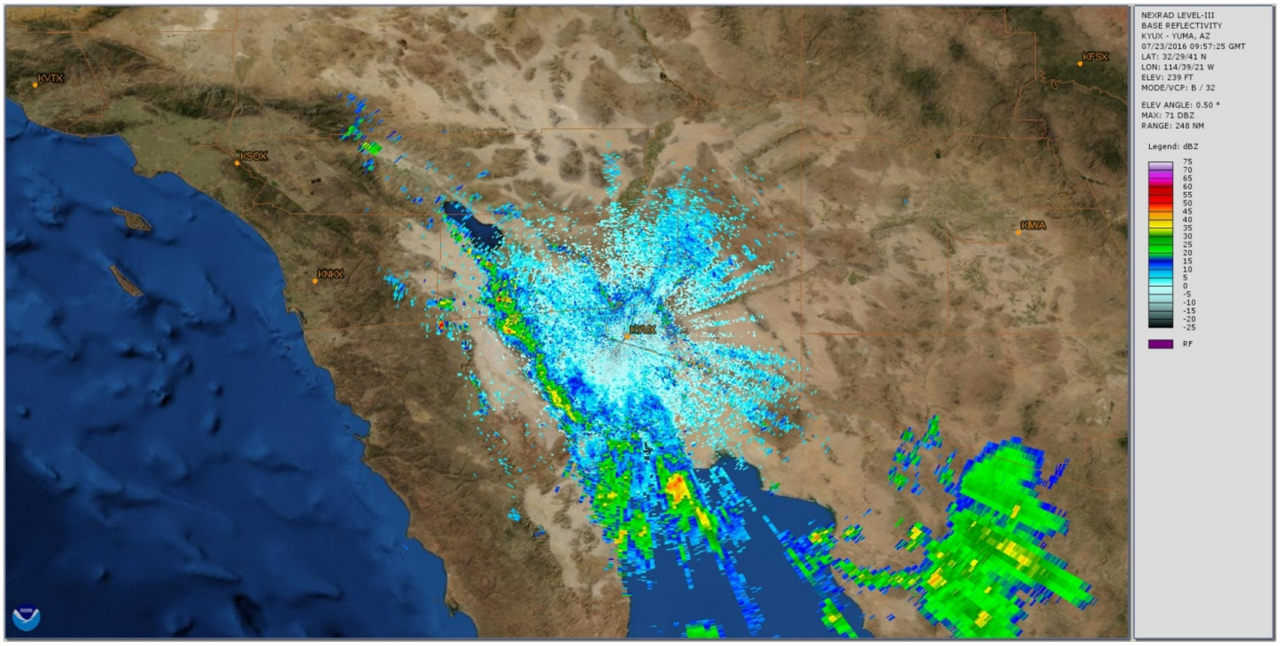


Fig 5-4: A NEXRAD base reflectivity image captured by the Yuma, AZ (KYUX) station at 0157 PST on July 23, 2016. Warmer colors indicate stronger areas of the weather system. Dynamically generated using NOAA's Weather & Climate Toolkit

FIGURE 5-5
NEXRAD BASE REFLECTIVITY JULY 24, 2016

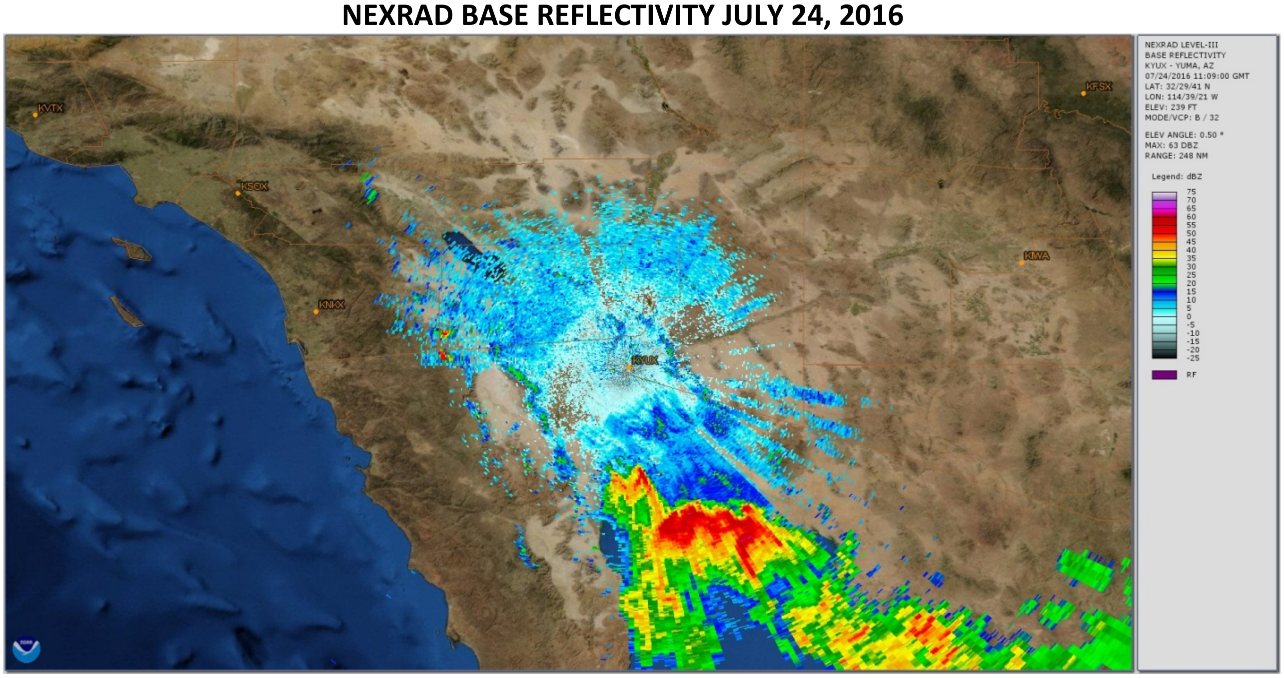


Fig 5-5: A NEXRAD base reflectivity image captured by the Yuma, AZ (KYUX) station at 0309 PST on July 24, 2016. Warmer colors indicate stronger areas of the weather system. Dynamically generated using NOAA's Weather & Climate Toolkit

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[16] **Tables 5-1 through 5-6** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding stations on July 23, 2016 and July 24, 2016. The tables show that peak hourly concentrations took place immediately following or during the period of high upstream wind speeds.

TABLE 5-1
CALEXICO PM_{10} CONCENTRATIONS AND WIND SPEEDS ON JULY 23, 2016

San Luis Colorado, Mexico (SLRS6)				Mexicali, MX (MXCB1)				Yuma, AZ MCAS (KNYL)				Mexicali, MX Intl. Airport (MMML)				Calexico FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	Obs.	**HOUR**	**PM_{10} ($\mu g/m^3$)**
0:00	5	175	7	0:00	7	157	12	0:57	5	160		0:43	8.1	140		0000	59
1:00	8	134	12	1:00	0	166	4	01:57	9	130		1:00				0100	51
2:00	9	136	14	2:50	2	42	10	02:57	8	150		2:00				0200	79
3:00	20	158	33	3:50	6	115	8	03:57	34	150	44	3:00				0300	44
4:50	21	162	34	4:00	6	113	12	04:57	29	160	38	4:00				0400	165
5:00	17	178	31	5:40	19	138	32	05:17	13	170		5:51	15.0	150		0500	153
6:10	15	177	28	6:20	18	147	36	06:57	11	160		6:46	19.6	150		0600	228
7:00	20	196	30	7:00	14	152	30	07:57	22	170	26	7:44	18.4	150	BLDU	0700	673
8:40	20	190	33	8:20	16	144	27	08:55	18	190		8:51	23.0	140	BLDU	0800	489
9:10	17	181	27	9:00	14	140	23	09:57	15	160		9:42	13.8	150		0900	232
10:00	15	193	22	10:00	9	134	16	10:57	15	170		10:46	12.7	120		1000	176
11:00	15	177	24	11:00	4	110	10	11:57	15	180	20	11:54	9.2	140		1100	128
12:50	15	183	25	12:00	4	132	11	12:57	14	170		13:00	9.2	130		1200	67
13:30	17	192	32	13:40	6	150	11	13:57	15	170		13:40	8.1	130		1300	67
14:50	20	191	34	14:00	7	142	13	14:57	16	180		14:48	15.0	120		1400	78
15:30	18	187	29	15:50	12	133	25	15:57	18	180	25	15:47	19.6	150	BLDU	1500	611
16:10	16	196	23	16:10	19	147	31	16:57	10	170		16:47	17.3	150	BLDU	1600	606
17:00	14	178	22	17:10	17	141	27	17:57	13	170		17:42	18.4	150	BLDU	1700	338
18:00	12	172	19	18:00	15	142	27	18:57	16	160		18:40	16.1	140		1800	96
19:00	14	165	21	19:50	12	144	23	19:57	17	160		19:44	13.8	150		1900	105
20:00	13	157	20	20:00	11	146	20	20:57	15	160		20:41	13.8	140		2000	69
21:00	12	172	20	21:00	14	152	23	21:57	13	160		21:47	13.8	140		2100	64
22:00	11	159	17	22:00	13	150	22	22:57	13	160		22:50	11.5	130		2200	62
23:00	11	151	14	23:00	10	135	17	23:57	8	170		23:47	3.4	120		2300	54

*****Wind data for KNYL from the NCEI's QCLCD system. Calexico PM10 data from AQS. San Luis Colorado, Mexicali Airport, and Mexicali wind data from the University of Utah's MesoWest. Wind speeds = mph; Direction = degrees. BLDU=observations of blowing dust

[16] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-2
EL CENTRO PM_{10} CONCENTRATIONS AND WIND SPEEDS JULY 23, 2016

San Luis Colorado, Mexico (SLRS6)				Mexicali, MX (MXCB1)				Yuma, AZ MCAS (KNYL)				Mexicali, MX Intl. Airport (MMML)				El Centro FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	Obs.	HOUR	PM_{10} (µg/m³)
0:00	5	175	7	0:00	7	157	12	0:57	5	160		0:43	8.1	140		0000	56
1:00	8	134	12	1:00	0	166	4	01:57	9	130		1:00				0100	43
2:00	9	136	14	2:50	2	42	10	02:57	8	150		2:00				0200	29
3:00	20	158	33	3:50	6	115	8	03:57	34	150	44	3:00				0300	27
4:50	21	162	34	4:00	6	113	12	04:57	29	160	38	4:00				0400	222
5:00	17	178	31	5:40	19	138	32	05:17	13	170		5:51	15.0	150		0500	233
6:10	15	177	28	6:20	18	147	36	06:57	11	160		6:46	19.6	150		0600	127
7:00	20	196	30	7:00	14	152	30	07:57	22	170	26	7:44	18.4	150	BLDU	0700	321
8:40	20	190	33	8:20	16	144	27	08:55	18	190		8:51	23.0	140	BLDU	0800	760
9:10	17	181	27	9:00	14	140	23	09:57	15	160		9:42	13.8	150		0900	414
10:00	15	193	22	10:00	9	134	16	10:57	15	170		10:46	12.7	120		1000	269
11:00	15	177	24	11:00	4	110	10	11:57	15	180	20	11:54	9.2	140		1100	178
12:50	15	183	25	12:00	4	132	11	12:57	14	170		13:00	9.2	130		1200	98
13:30	17	192	32	13:40	6	150	11	13:57	15	170		13:40	8.1	130		1300	70
14:50	20	191	34	14:00	7	142	13	14:57	16	180		14:48	15.0	120		1400	71
15:30	18	187	29	15:50	12	133	25	15:57	18	180	25	15:47	19.6	150	BLDU	1500	435
16:10	16	196	23	16:10	19	147	31	16:57	10	170		16:47	17.3	150	BLDU	1600	521
17:00	14	178	22	17:10	17	141	27	17:57	13	170		17:42	18.4	150	BLDU	1700	573
18:00	12	172	19	18:00	15	142	27	18:57	16	160		18:40	16.1	140		1800	144
19:00	14	165	21	19:50	12	144	23	19:57	17	160		19:44	13.8	150		1900	86
20:00	13	157	20	20:00	11	146	20	20:57	15	160		20:41	13.8	140		2000	86
21:00	12	172	20	21:00	14	152	23	21:57	13	160		21:47	13.8	140		2100	49
22:00	11	159	17	22:00	13	150	22	22:57	13	160		22:50	11.5	130		2200	33
23:00	11	151	14	23:00	10	135	17	23:57	8	170		23:47	3.4	120		2300	35

*****Wind data for KNYL from the NCEI's QCLCD system. El Centro PM10 data from AQS. San Luis Colorado, Mexicali Airport, and Mexicali wind data from the University of Utah's MesoWest. Wind speeds = mph; Direction = degrees. BLDU=observations of blowing dust.

TABLE 5-3
CALEXICO PM_{10} CONCENTRATIONS AND WIND SPEEDS JULY 24, 2016

San Luis Colorado, Mexico (SLRS6)				Mexicali, MX (MXCB1)				Yuma, AZ MCAS (KNYL)				Mexicali, MX Intl. Airport (MMML)				Calexico FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	Obs.	HOUR	W/S	W/D	W/	HOUR	W/S	W/D	Obs.	HOUR	PM_{10} (µg/m³)
0:00	10	152	14	0:00	7	157	12	57	7	190		0:40	9	110		0000	54
1:00	7	157	10	1:00	0	166	4	157	7	180		1:00				0100	74
2:00	5	142	7	2:50	2	42	10	257	14	150		2:00				0200	74
3:00	11	163	19	3:50	6	115	8	357	25	150	34	3:00				0300	43
4:50	16	164	25	4:00	6	113	12	407	29	150	36	4:00				0400	43
5:30	18	171	28	5:40	19	138	32	557	23	160	39	5:57	8	120		0500	46
6:30	24	175	38	6:20	18	147	36	657	32	160	43	6:44	13	120		0600	69
7:40	25	177	40	7:00	14	152	30	757	26	170		7:45	20	140		0700	409
8:20	21	178	34	8:20	16	144	27	857	23	170		8:41	26	120	BLDU	0800	985
9:00	20	182	30	9:00	14	140	23	957	22	170		9:42	24	140	BLDU	0900	723
10:00	18	182	29	10:00	9	134	16	1057	16	190	25	10:40	21	130	BLDU	1000	303
11:00	19	197	27	11:00	4	110	10	1157	16	180		11:44	14	140	BLDU	1100	241
12:00	15	180	22	12:00	4	132	11	1257	17	170	23	12:42	8	110	BLDU	1200	227
13:00	14	180	22	13:40	6	150	11	1357	16	190		13:40	8	130		1300	199
14:00	13	184	20	14:00	7	142	13	1457	14	200		14:49	10	160		1400	143
15:00	19	189	28	15:50	12	133	25	1557	24	190		15:50	13	140	BLDU	1500	275
16:00	17	171	25	16:10	19	147	31	1657	18	180		16:45	20	140		1600	242
17:00	17	187	27	17:10	17	141	27	1757	17	190		17:48	22	130		1700	145
18:00	14	195	21	18:00	15	142	27	1857	13	190		18:48	16	150		1800	91
19:00	13	188	19	19:50	12	144	23	1957	16	160		19:55	13	140		1900	56
20:00	13	172	20	20:00	11	146	20	2057	14	170		20:47	10	130		2000	63
21:00	13	167	19	21:00	14	152	23	2157	9	180		21:40	13	150		2100	56
22:00	14	170	20	22:00	13	150	22	2257	10	170		22:43	13	150		2200	56
23:00	11	166	16	23:00	10	135	17	2357	10	170		23:49	8	120		2300	53

*****Wind data for KNYL from the NCEI's QCLCD system. Calexico PM10 data from AQS. San Luis Colorado, Mexicali, and Mexicali Airport wind data from the University of Utah's MesoWest. Wind speeds = mph; Direction = degrees. BLDU=observations of blowing dust

TABLE 5-4
EL CENTRO PM_{10} CONCENTRATIONS AND WIND SPEEDS JULY 24, 2016

San Luis Colorado, Mexico (SLRS6)				Mexicali, MX (MXCB1)				Yuma, AZ MCAS (KNYL)				Mexicali, MX Intl. Airport (MMML)				El Centro FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	Obs.	HOUR	W/S	W/D	W/	HOUR	W/S	W/D	Obs.	HOUR	PM_{10} (µg/m³)
0:00	10	152	14	0:00	7	157	12	57	7	190		0:40	9	110		0000	35
1:00	7	157	10	1:00	0	166	4	157	7	180		1:00				0100	27
2:00	5	142	7	2:50	2	42	10	257	14	150		2:00				0200	36
3:00	11	163	19	3:50	6	115	8	357	25	150	34	3:00				0300	31
4:50	16	164	25	4:00	6	113	12	407	29	150	36	4:00				0400	27
5:30	18	171	28	5:40	19	138	32	557	23	160	39	5:57	8	120		0500	31
6:30	24	175	38	6:20	18	147	36	657	32	160	43	6:44	13	120		0600	53
7:40	25	177	40	7:00	14	152	30	757	26	170		7:45	20	140		0700	247
8:20	21	178	34	8:20	16	144	27	857	23	170		8:41	26	120	BLDU	0800	995
9:00	20	182	30	9:00	14	140	23	957	22	170		9:42	24	140	BLDU	0900	660
10:00	18	182	29	10:00	9	134	16	1057	16	190	25	10:4	21	130	BLDU	1000	162
11:00	19	197	27	11:00	4	110	10	1157	16	180		11:4	14	140	BLDU	1100	107
12:00	15	180	22	12:00	4	132	11	1257	17	170	23	12:4	8	110	BLDU	1200	91
13:00	14	180	22	13:40	6	150	11	1357	16	190		13:4	8	130		1300	214
14:00	13	184	20	14:00	7	142	13	1457	14	200		14:4	10	160		1400	190
15:00	19	189	28	15:50	12	133	25	1557	24	190		15:5	13	140	BLDU	1500	259
16:00	17	171	25	16:10	19	147	31	1657	18	180		16:4	20	140		1600	290
17:00	17	187	27	17:10	17	141	27	1757	17	190		17:4	22	130		1700	151
18:00	14	195	21	18:00	15	142	27	1857	13	190		18:4	16	150		1800	88
19:00	13	188	19	19:50	12	144	23	1957	16	160		19:5	13	140		1900	65
20:00	13	172	20	20:00	11	146	20	2057	14	170		20:4	10	130		2000	44
21:00	13	167	19	21:00	14	152	23	2157	9	180		21:4	13	150		2100	37
22:00	14	170	20	22:00	13	150	22	2257	10	170		22:4	13	150		2200	37
23:00	11	166	16	23:00	10	135	17	2357	10	170		23:4	8	120		2300	31

*****Wind data for KNYL from the NCEI's QCLCD system. El Centro PM10 data from AQS. San Luis Colorado and Mexicali Airport wind data from the University of Utah's MesoWest. Wind speeds = mph; Direction = degrees. BLDU=observations of blowing dust

TABLE 5-5
BRAWLEY PM_{10} CONCENTRATIONS AND WIND SPEEDS JULY 24, 2016

San Luis Colorado, Mexico (SLRS6)				Mexicali, MX Intl. Airport (MMML)				Yuma, AZ MCAS (KNYL)				Imperial County Airport (KIPL)				BRAWLEY FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	Obs.	HOUR	W/S	W/D	W/	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m³)
0:00	10	152	14	0:40	9	110		57	7	190		53	10	140		0000	35
1:00	7	157	10	1:00				157	7	180		153	7	130		0100	27
2:00	5	142	7	2:00				257	14	150		253	8	130		0200	36
3:00	11	163	19	3:00				357	25	150	34	353	6	110		0300	31
4:50	16	164	25	4:00				407	29	150	36	453	11	130		0400	27
5:30	18	171	28	5:57	8	120		557	23	160	39	553	16	140		0500	31
6:30	24	175	38	6:44	13	120		657	32	160	43	653	25	140	31	0600	53
7:40	25	177	40	7:45	20	140		757	26	170		753	17	160		0700	247
8:20	21	178	34	8:41	26	120	BLD	857	23	170		832	21	150	28	0800	995
9:00	20	182	30	9:42	24	140	BLD	957	22	170		905	16	170		0900	660
10:00	18	182	29	10:40	21	130	BLD	1057	16	190	25	1053	5	240		1000	162
11:00	19	197	27	11:44	14	140	BLD	1157	16	180		1153	5	300		1100	107
12:00	15	180	22	12:42	8	110	BLD	1257	17	170	23	1253	0	0		1200	91
13:00	14	180	22	13:40	8	130		1357	16	190		1353	5	VR		1300	214
14:00	13	184	20	14:49	10	160		1457	14	200		1453	7	120		1400	190
15:00	19	189	28	15:50	13	140	BLD	1557	24	190		1551	22	140		1500	259
16:00	17	171	25	16:45	20	140		1657	18	180		1653	24	140		1600	290
17:00	17	187	27	17:48	22	130		1757	17	190		1753	21	140	28	1700	151
18:00	14	195	21	18:48	16	150		1857	13	190		1853	14	150		1800	88
19:00	13	188	19	19:55	13	140		1957	16	160		1953	13	150		1900	65
20:00	13	172	20	20:47	10	130		2057	14	170		2053	15	130		2000	44
21:00	13	167	19	21:40	13	150		2157	9	180		2153	14	140		2100	37
22:00	14	170	20	22:43	13	150		2257	10	170		2253	13	150		2200	37
23:00	11	166	16	23:49	8	120		2357	10	170		2353	10	120		2300	31

*Wind data for KNYL and KIPL from the NCEI's QCLCD system. Brawley PM10 data from AQS. Brawley does not record wind data. San Luis Colorado and Mexicali Airport wind data from the University of Utah's MesoWest. Wind speeds = mph; Direction = degrees. BLDU=observations of blowing dust

TABLE 5-6
WESTMORLAND PM_{10} CONCENTRATIONS AND WIND SPEEDS JULY 24, 2016

San Luis Colorado, Mexico (SLRS6)				Mexicali, MX Intl. Airport (MMML)				Yuma, AZ MCAS (KNYL)				Imperial County Airport (KIPL)				Westmorland FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	Obs.	HOUR	W/S	W/D	W/	HOUR	W/S	W/D	W/G	HOUR	PM_{10} (µg/m³)
0:00	10	152	14	0:40	9	110		57	7	190		53	10	140		0000	26
1:00	7	157	10	1:00				157	7	180		153	7	130		0100	23
2:00	5	142	7	2:00				257	14	150		253	8	130		0200	23
3:00	11	163	19	3:00				357	25	150	34	353	6	110		0300	24
4:50	16	164	25	4:00				407	29	150	36	453	11	130		0400	22
5:30	18	171	28	5:57	8	120		557	23	160	39	553	16	140		0500	23
6:30	24	175	38	6:44	13	120		657	32	160	43	653	25	140	31	0600	40
7:40	25	177	40	7:45	20	140		757	26	170		753	17	160		0700	146
8:20	21	178	34	8:41	26	120	BLD	857	23	170		832	21	150	28	0800	525
9:00	20	182	30	9:42	24	140	BLD	957	22	170		905	16	170		0900	909
10:00	18	182	29	10:40	21	130	BLD	1057	16	190	25	1053	5	240		1000	461
11:00	19	197	27	11:44	14	140	BLD	1157	16	180		1153	5	300		1100	245
12:00	15	180	22	12:42	8	110	BLD	1257	17	170	23	1253	0	0		1200	204
13:00	14	180	22	13:40	8	130		1357	16	190		1353	5	VR		1300	247
14:00	13	184	20	14:49	10	160		1457	14	200		1453	7	120		1400	213
15:00	19	189	28	15:50	13	140	BLD	1557	24	190		1551	22	140		1500	186
16:00	17	171	25	16:45	20	140		1657	18	180		1653	24	140		1600	291
17:00	17	187	27	17:48	22	130		1757	17	190		1753	21	140	28	1700	137
18:00	14	195	21	18:48	16	150		1857	13	190		1853	14	150		1800	60
19:00	13	188	19	19:55	13	140		1957	16	160		1953	13	150		1900	30
20:00	13	172	20	20:47	10	130		2057	14	170		2053	15	130		2000	38
21:00	13	167	19	21:40	13	150		2157	9	180		2153	14	140		2100	34
22:00	14	170	20	22:43	13	150		2257	10	170		2253	13	150		2200	22
23:00	11	166	16	23:49	8	120		2357	10	170		2353	10	120		2300	20

***Wind data for KNYL and KIPL from the NCEI's QCLCD system. Westmorland PM10 data from AQS. San Luis Colorado and Mexicali Airport wind data from the University of Utah's MesoWest. Wind speeds = mph; Direction = degrees. BLDU=observations of blowing dust

As mentioned above, an unexpected Gulf Surge, likely influenced from the meteorological eents surrounding tropical storm "Frank" entered Imperial County on July 23, 2016 and July 24, 2016. Strong outflow and outflow driven Gulf Surge south to southeasterly gusty winds affected Imperial County, Riverside County and Yuma Arizona.

Locally, winds elevated and were gusty on July 23, 2016 through July 24, 2016 throughout the region. At the Yuma MCAS (KNYL), the Mexicali airport (MMML), the Imperial County airport (KIPL), the El Centro NAF (KNJK) and the Calexico station all begin to measure elevated wind speeds at approximately 0400 am PST on July 23, 2016 and continued at moderate levels through July 24, 2016. Measured winds at the Yuma MCAS were the highest for both July 23, 2016 and July 24, 2016 with a combined six (6) hours of winds at or above 25 mph and eleven (11) hours of gusts up to 44 mph. KIPL and KNJK both measured winds up to 24 mph with KIPL measuring a combined five (5) hours of gusts up to 31 mph while KNJK measured a single hour of gust at 20 mph. In addition, both KIPL and KNJK reported haze coincident with measured peak concentrations at all the air monitoring stations.

Although winds were elevated, the Calexico station did not measure winds at or above 25 mph, the Mexicali airport measured one hour at or above 25 mph. The El Centro, Westmorland and Niland stations all began measuring elevated winds, albeit below the 25 mph threshold approximately one hour later. Likewise, the Blythe airport (KBLH) began measuring elevated winds at approximately 0500 PST with a combined two (2) hours of winds measured above the 25 mph threshold and ten (10) hours of gusts up to 38mph. Finally, on July 23, 2016 and July 24, 2016 other airports located in Mexico, such as the San Luis Colorado airport, measured elevated moderate winds as early as 0400 PST July 23, 2016 with significant wind gusts reaching 40 mph.

Figures 5-6 and 5-7 provide a general timeline of of the events contributing to the exceedance at the Brawley, Calexico, El Centro and Westmorland monitors.

FIGURE 5-6
EXCEEDANCE TIMELINE JULY 23, 2016

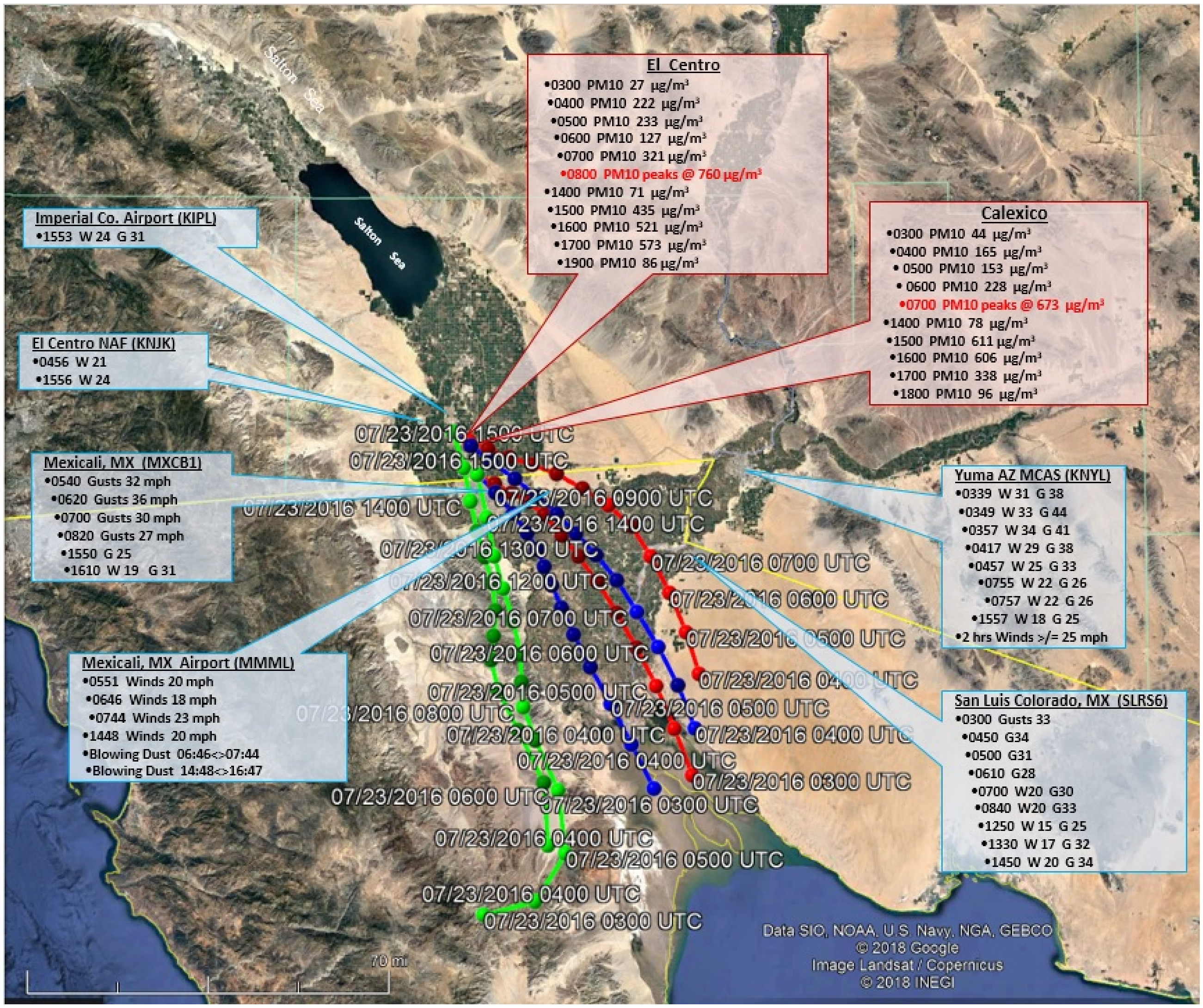


Fig 5-6: The 12-hour HYSPLIT trajectories show the path of the air parcel ending at 0700 PST during the hour of measured peak concentration at Calexico, and at 0800 PST at El Centro. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green is 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 5-7
EXCEEDANCE TIMELINE JULY 24, 2016

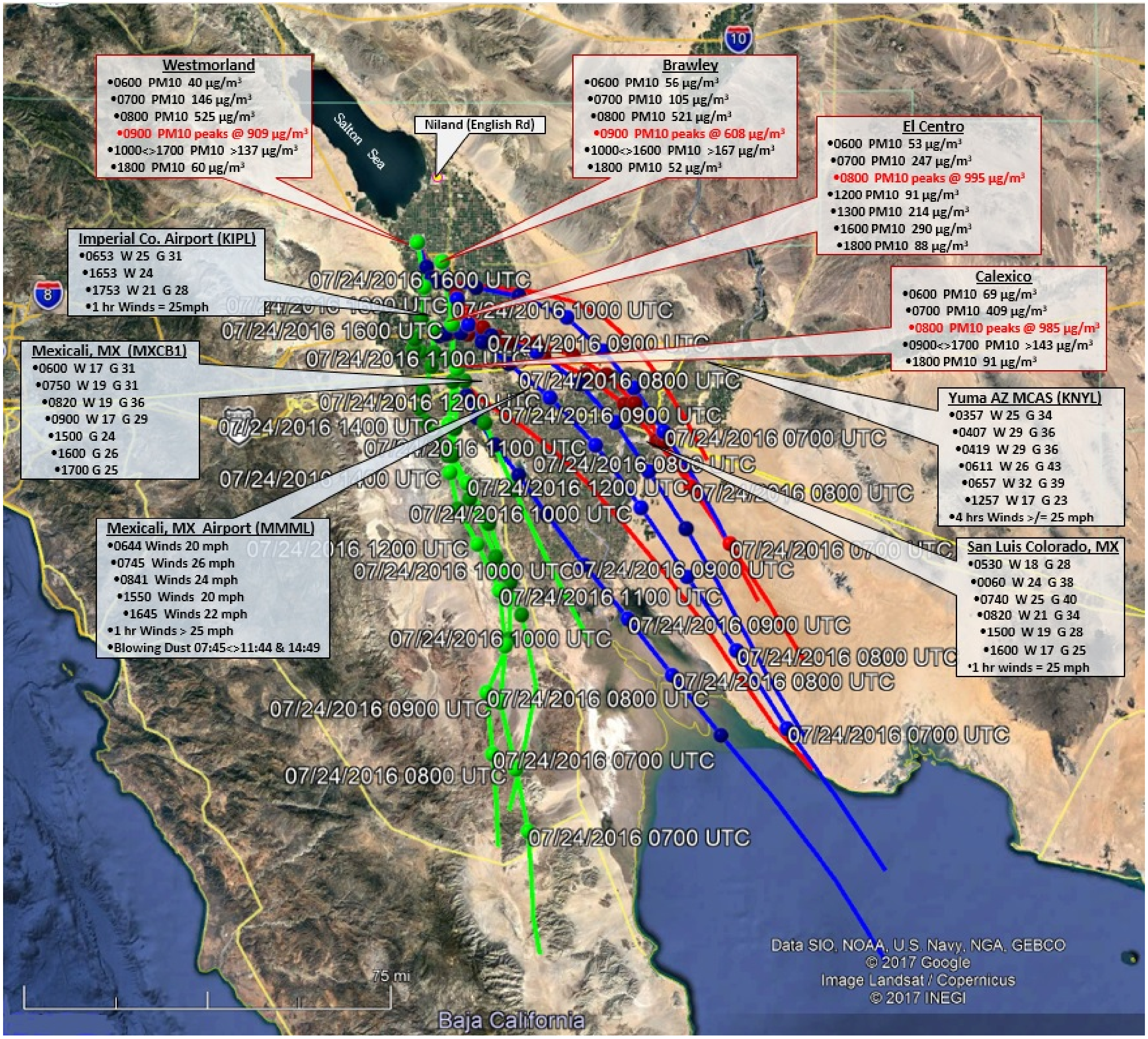


Fig 5-7: The 12-hour HYSPLIT trajectories show the path of the air parcel ending at 0800 PST during the hour of peak concentration at Calexico and El Centro, and at 0900 PST during peak concentration at Brawley and Westmorland. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green is 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 5-8 through 5-11 depict PM_{10} concentrations and wind speeds over a 96-hour period at the Brawley, Calexico, El Centro, and Westmorland monitors. Because of the suddenness of the event, the unexpected Gulf Surge, the affect upon air quality and the monitors occurred as the gusts associated with the energy of the outflow boundary caused dust to suspend and deposit onto monitors. Although winds were moderate through both days, the gusts truly affected the level of suspended particulates and the transport of windblown dust into Imperial County. Fluctuations in hourly concentrations at the monitors over 96 hours show a positive correlation with wind speeds and gusts at upstream sites.

FIGURE 5-8
BRAWLEY PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

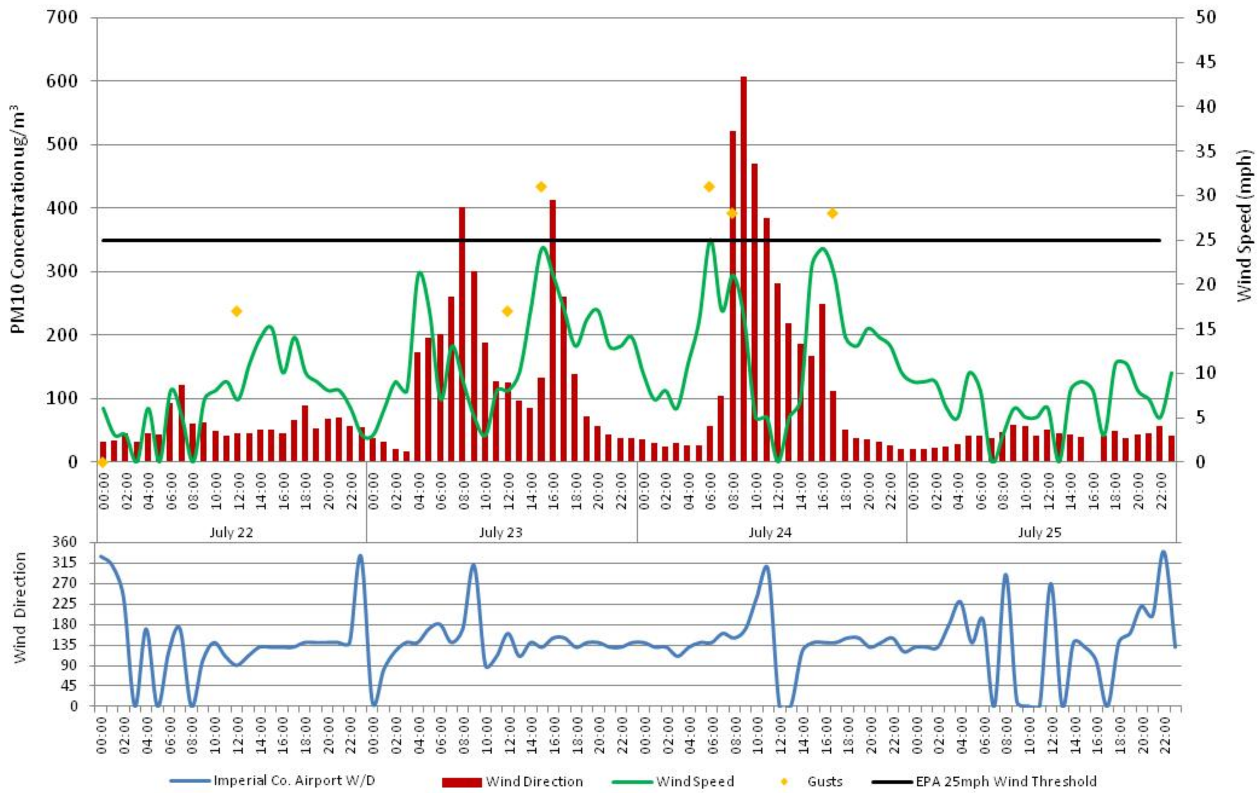


Fig 5-8: Fluctuations in hourly concentrations over 96 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL). Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-9
CALEXICO PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

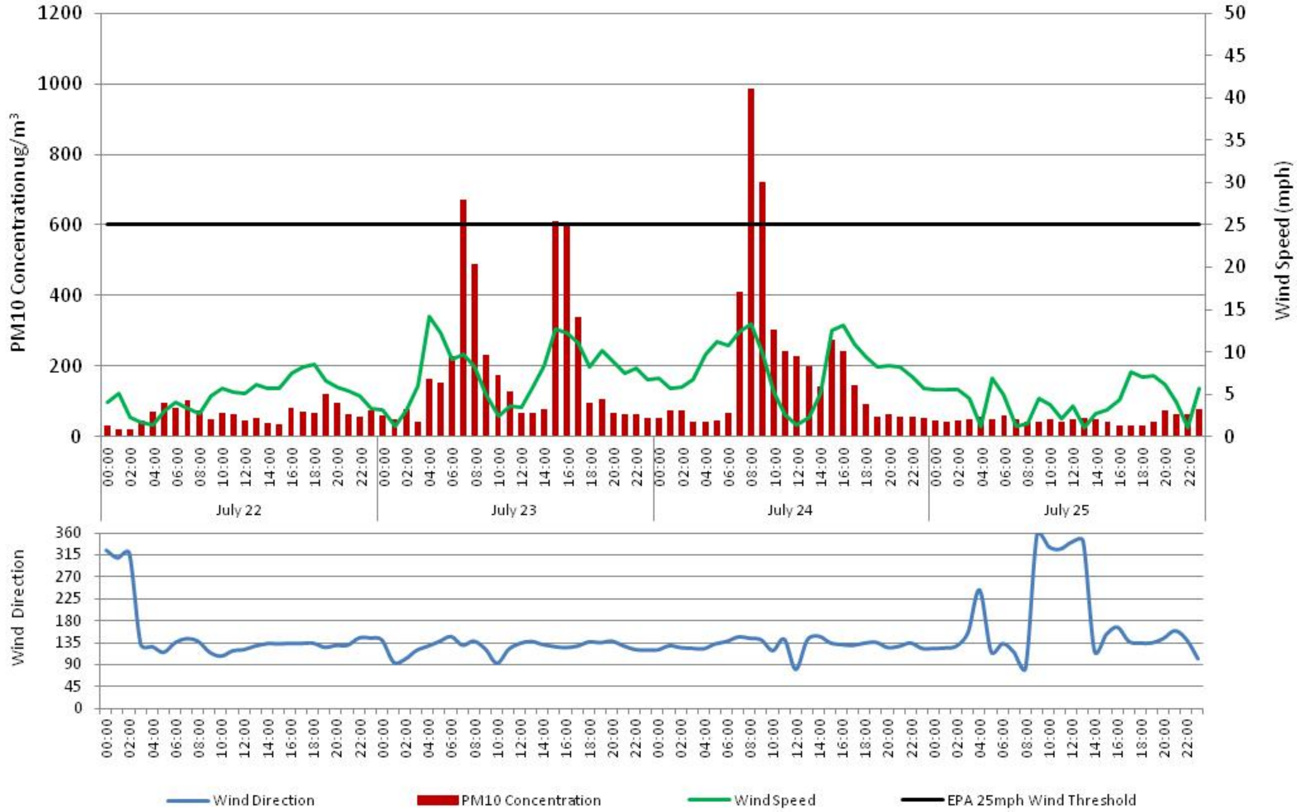


Fig 5-9: Winds at Calexico did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-10
EL CENTRO PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

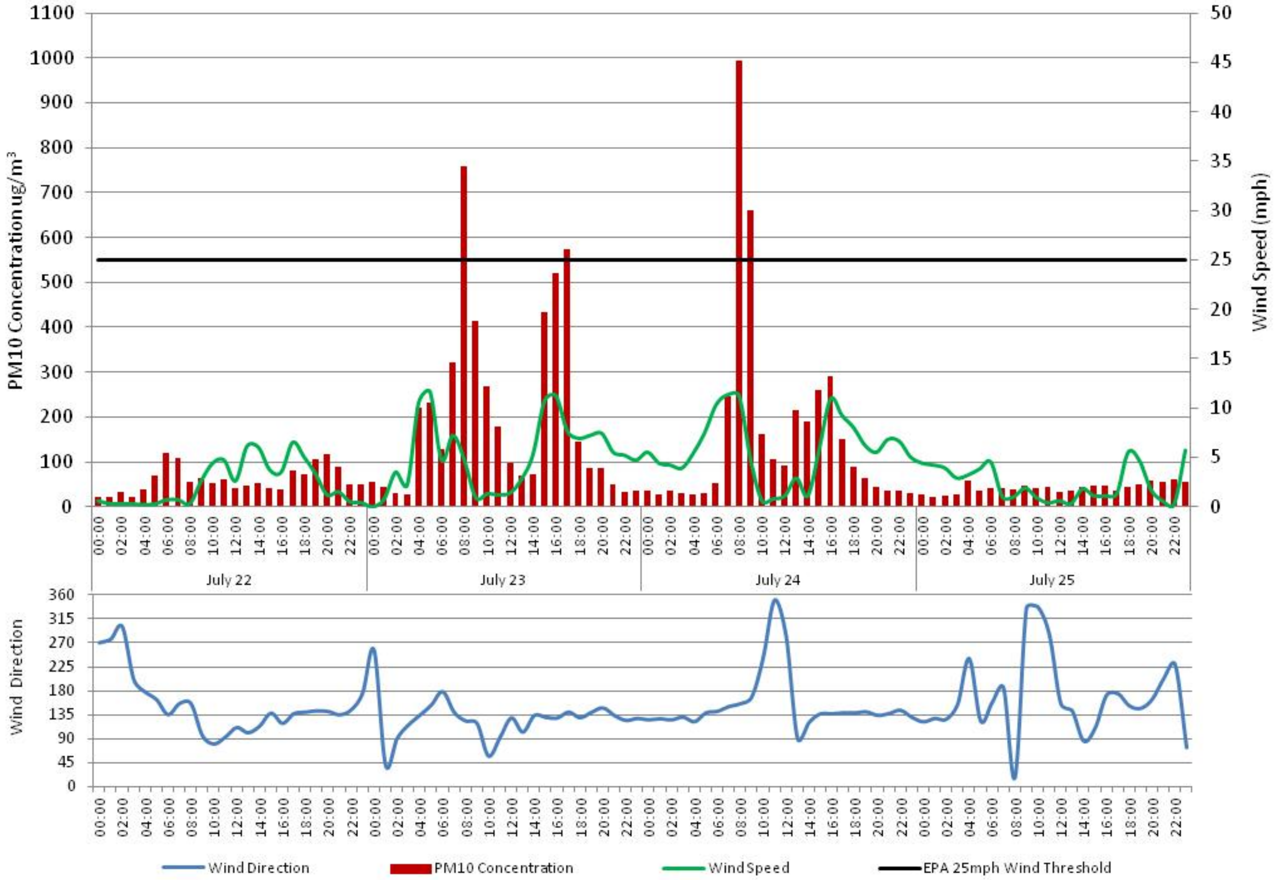


Fig 5-10: Winds at El Centro did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-11
WESTMORLAND PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

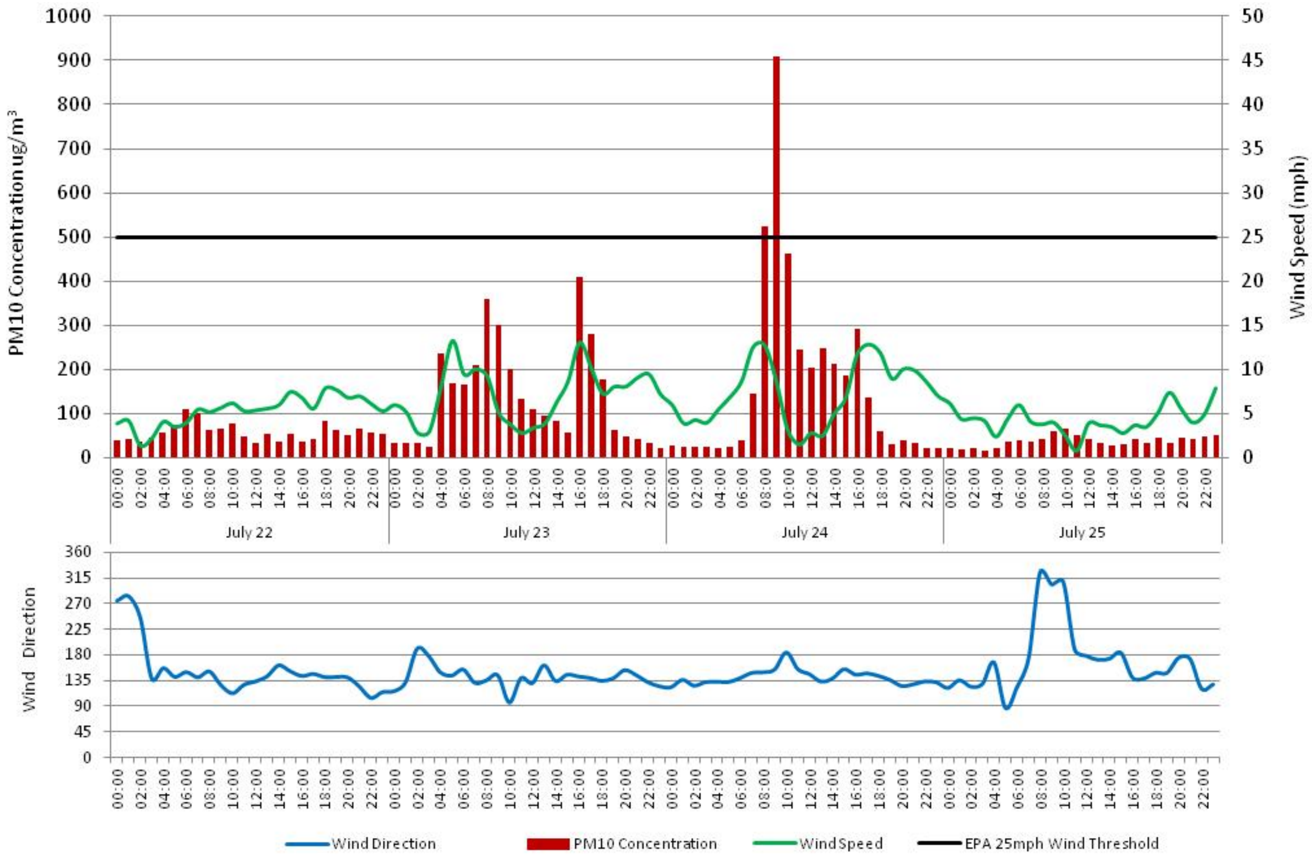


Fig 5-11: Winds at Westmorland did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-12 depicts the relationship between the 96-hour PM_{10} fluctuations by the Brawley, Calexico, El Centro, and Westmorland monitors together with upstream wind speeds. A positive correlation is evident between elevated wind speeds and gusts with elevated concentrations at the monitors. **Appendix C** contains additional graphs illustrating the relationship between PM_{10} concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

FIGURE 5-12
PM_{10} CONCENTRATIONS & UPSTREAM WIND SPEED CORRELATIONS

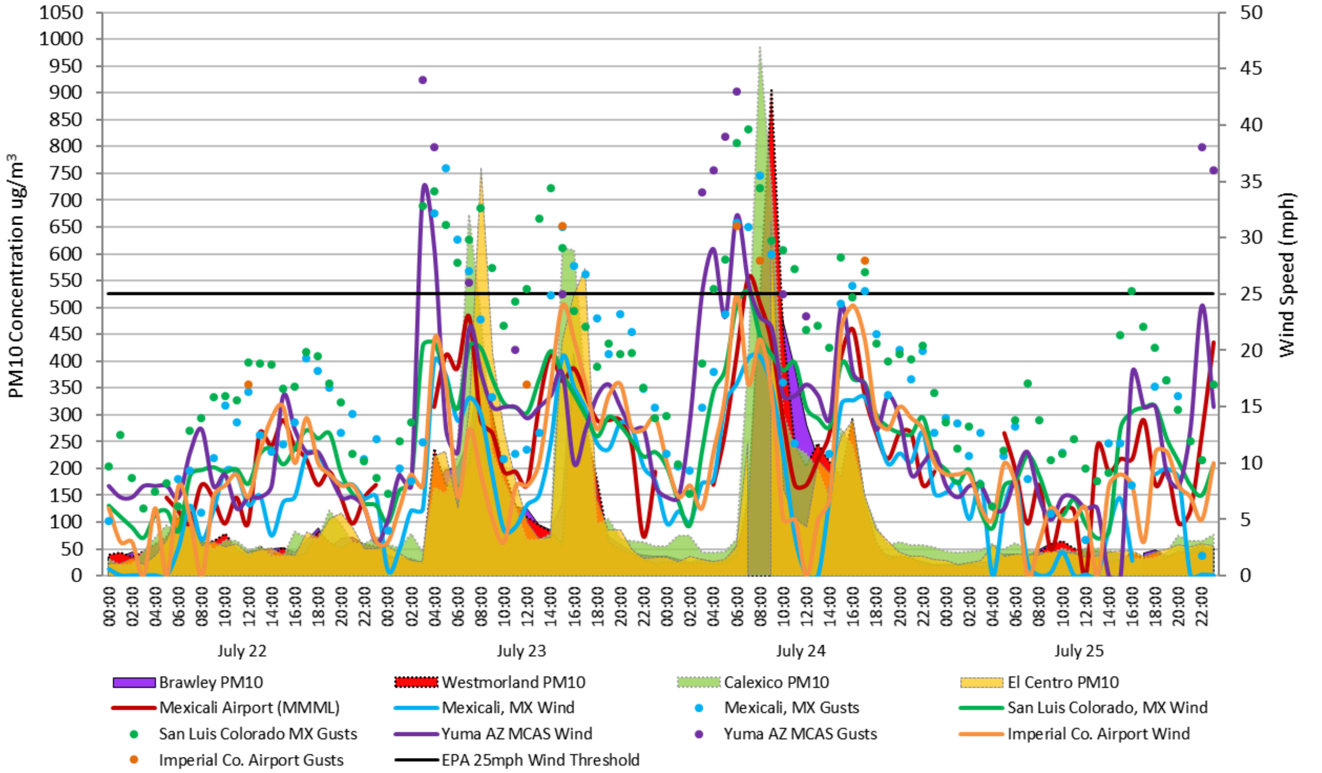


Fig 5-12: This graph depicts the 96-hour PM_{10} fluctuations by the Brawley, Calexico, El Centro, and Westmorland monitors together with upstream wind speeds. A positive correlation between elevated wind speeds is evident, particularly with gusts. Black line indicates the 25 mph threshold

Figure 5-13 compares the 96-hour concentrations at Brawley, Calexico, El Centro, Westmorland, and Niland with visibility[17] at local airports between July 23, 2016 and July 24, 2016. Generally, drops in visibility correspond to highest hourly concentrations at the monitors.

[17] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm.

FIGURE 5-13
96 HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

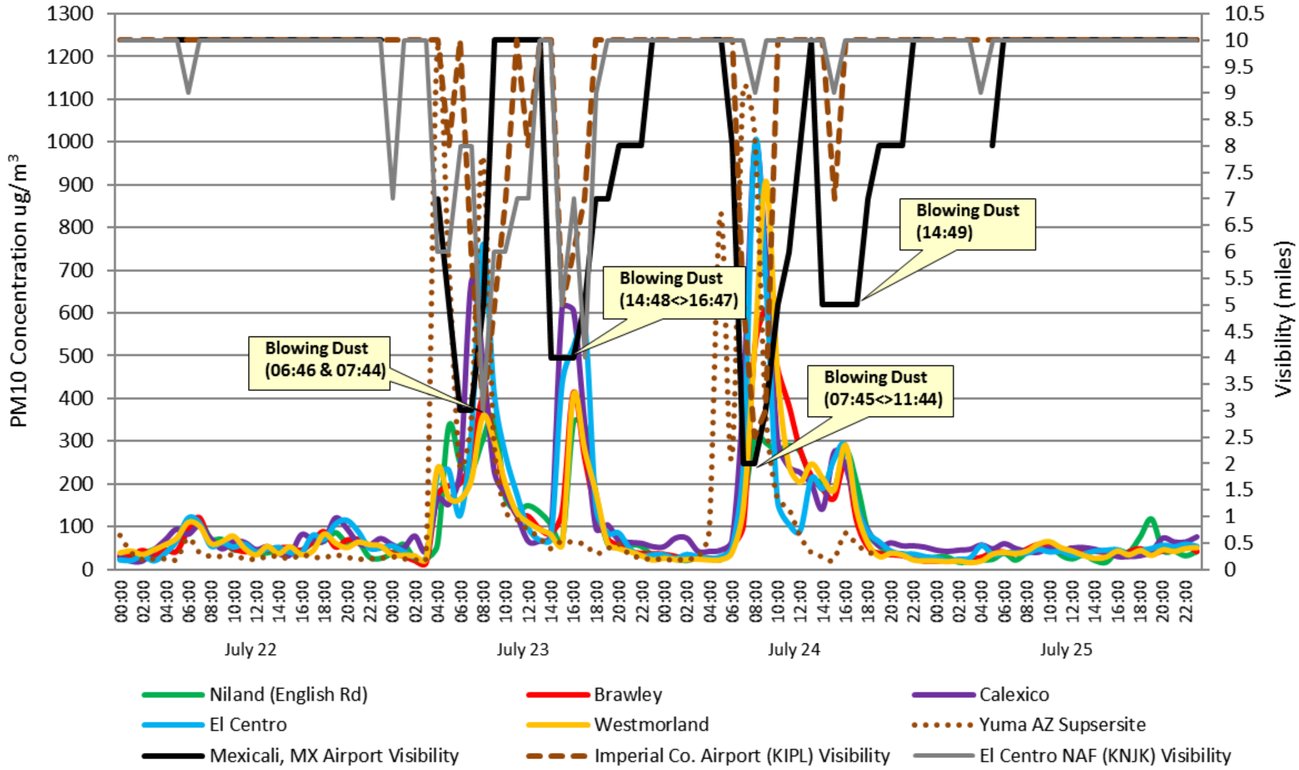


Fig 5-13: Visibility as reported from Mexicali, Mexico International Airport (MMML) shows that visibility dipped significantly at MMML coincident to peak concentrations at Brawley, Calexico, El Centro, and Westmorland. Visibility data from the University of Utah's MesoWest

As discussed above, an unexpected intrusion of a Gulf Surge cause convective outflow boundaries with south to southeast gusty winds to affect air quality in Imperial County. **Figures 5-14 and 5-15** show the impact of the transported dust on air quality in the region. Additionally, Air Quality Alerts issued for Calexico and El Centro on July 24, 2016 provide additional supporting evidence that air quality was affected. **Appendix A** contains copies of notices as they pertain to the July 23, 2016 and July 24, 2016 event.

Figure 5-14 shows the air quality[18] in Calexico during July 23, 2016. Air quality remained in the "Yellow" or Moderate category (PM_{10} 51-100 µg/m^3) until 4 p.m. when at 5 p.m. air quality

[18] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://www.airnow.gov/index.cfm?action=aqibasics.aqi.

dropped into the "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3) where it remained for the rest of the day. **Figure 5-15** shows the air quality in El Centro during July 23, 2016. Air quality remained in the "Yellow" or Moderate category (PM_{10} 51-100 µg/m^3) until 4 p.m. when at 5 p.m. air quality dropped into the "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3) where it remained for the rest of the day. See **Appendix A** for Air Quality Index chart.

FIGURE 5-14
IMPERIAL VALLEY AIR QUALITY INDEX IN CALEXICO
JULY 23, 2016

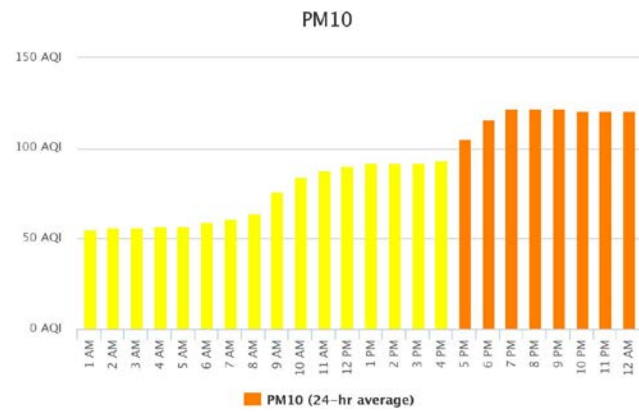


Fig 5-14: The reduced air quality in Calexico is indicated by the AQI level changes as transported windblown dust affected Imperial County. Source: ICAPCD archives

FIGURE 5-15
IMPERIAL VALLEY AIR QUALITY INDEX IN EL CENTRO
JULY 23, 2016

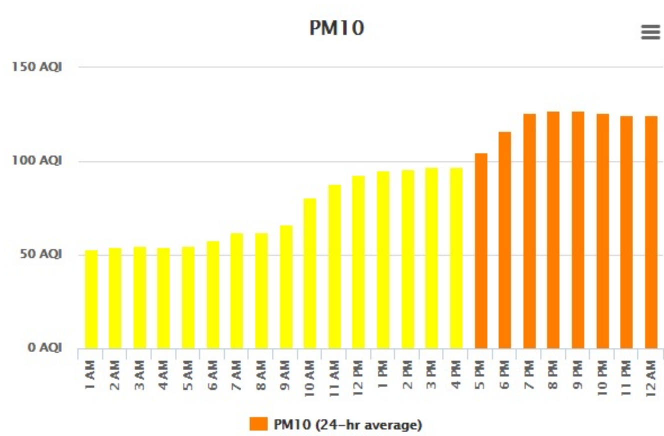


Fig 5-15: The reduced air quality in El Centro is indicated by the AQI level changes as transported windblown dust affected Imperial County. Source: ICAPCD archives

Figure 5-16 shows that air quality in Brawley was in the "Yellow" category from the beginning of the day until it dropped into the "Orange" level at 1 p.m. where it remained for the remainder of the day. Both Calexico and El Centro's AQI (**Figs. 5-17 and 5-18**) on July 24, 2016 was in the

"Orange" or Unhealthy for Sensitive Groups level (PM10 101-150 µg/m^3) from 1 a.m. to 10 a.m. Air quality then briefly rose to the "Yellow" or Moderate level (PM10 51-100 µg/m^3) for one hour starting at 11 a.m. At 12 p.m. air quality once again slid into the "Orange" or Unhealthy for Sensitive Groups level (PM10 101-150 µg/m^3) where it remained until 5 p.m., when air quality once again rose to the "Yellow" or Moderate category. Westmorland's AQI (**Fig. 5-19**) on July 24, 2016 was in the "Yellow" category from 1 a.m. until 12 p.m. when it entered the "Orange" level where it remained the rest of the day.

FIGURE 5-16
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
JULY 24, 2016

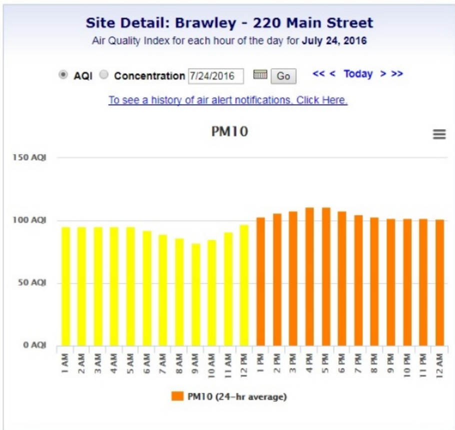


Fig 5-16: The reduced air quality in Brawley is indicated by the AQI level changes as transported windblown dust affected Imperial County. Source: ICAPCD archives

FIGURE 5-17
IMPERIAL VALLEY AIR QUALITY INDEX IN CALEXICO
JULY 24, 2016

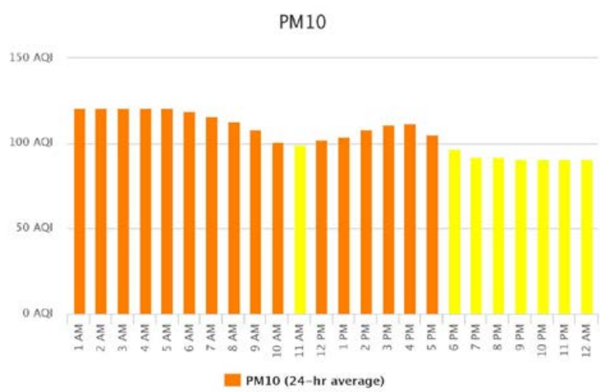


Fig 5-17: The reduced air quality in Calexico is indicated by the AQI level changes as transported windblown dust affected Imperial County. Source: ICAPCD archives

FIGURE 5-18
IMPERIAL VALLEY AIR QUALITY INDEX IN EL CENTRO
JULY 24, 2016

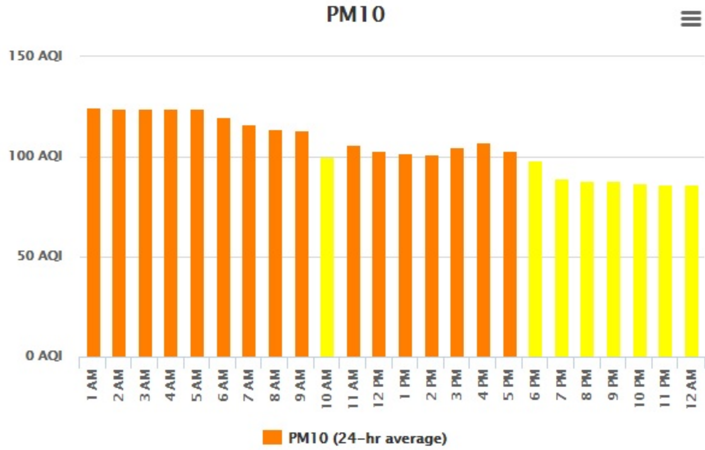


Fig 5-18: The reduced air quality in El Centro is indicated by the AQI level changes as transported windblown dust affected Imperial County. Source: ICAPCD archives

FIGURE 5-19
IMPERIAL VALLEY AIR QUALITY INDEX IN WESTMORLAND
JULY 24, 2016

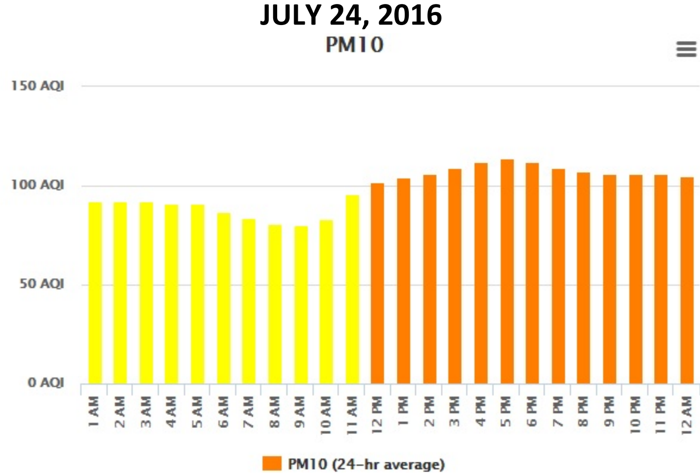


Fig 5-19: The reduced air quality in Westmorland is indicated by the AQI level changes as transported windblown dust affected Imperial County. Source: ICAPCD archives.

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the intrusion of the Gulf Surge and associated south to southeast gusty winds upon Imperial, Riverside and Yuma Counties. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley, Calexico, El Centro, and Westmorland monitors on

July 23, 2016 and July 24, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the southwest portion of Yuma County, Arizona, all of Imperial County, and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} were transported by gusty south to southeast winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the natural open desert areas located within northern Mexico, including northern Baja California and southeast Imperial County. Combined, the information demonstrates that the elevated PM_{10} concentrations measured on July 23, 2016 and July 24, 2016 coincided with gusty wind speeds and that gusty south to southeast winds were experienced over the southeastern, southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-20
JULY 23, 2016 AND JULY 24, 2016 WIND EVENT TAKEAWAY POINTS

Fig 5-20: Is a summary of the meteorological conditions and facts that qualify the July 23, 2016 and July 24, 2016 event, which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on July 23, 2016 and July 24, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1
TECHNICAL ELEMENTS CHECKLIST

	EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})	DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-42; 88
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	63-86; 87
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	43-54; 88
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	55-62; 87
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	63-86; 87

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the July 23, 2016 and July 24, 2016 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played litter or no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial

County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley, Calexico, El Centro, and Westmorland monitors were caused by naturally occurring strong gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions of northern Mexico to the south of Imperial County. These facts provide strong evidence that the PM_{10} exceedances at Brawley, Calexico, El Centro, and Westmorland on July 23, 2016 and July 24, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event with its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. Anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions. As discussed within this demonstration, the PM_{10} exceedances that occurred at the Brawley, Calexico, El Centro and Westmorland monitors on July 23, 2016 and July 24, 2016 were caused by the transport of windblown dust into Imperial County by strong south to southeast gusty winds associated with the intrusion of an unexpected Gulf Surge and its associated strong outflow boundaries. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations measured at Brawley, Calexico, El Centro and Westmorland during different days and the comparative analysis of different areas in Imperial, Riverside and Yuma Counties, demonstrates a consistency of elevated gusty south to southeast winds and concentrations of PM_{10} on July 23, 2016 and July 24, 2016, (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty south to southeast winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty south to southeast winds. Days immediately before and after the gusty wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on July 23, 2016 and July 24, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley, Calexico, El Centro, and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around July 23, 2016 and July 24, 2016. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.